The Foundry

VOLUME 65 • NUMBER 5

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TURRET AND PAN
made for
Cleveland Hobbing
Machine Company

"Made in all oil and they're you may be

THE HILL CLUTCH

Makers of precision
certainty of results,

Turret is 5 feet in diameter and weighs 3 tons. Cast in flask with all core sand, 2½ tons of core sand. Two days are required to set up the cores alone and ⅛-inch error at any point means rejection. Nearly 200 turret castings have been delivered. Pan is 9 feet across and weighs 3 tons.

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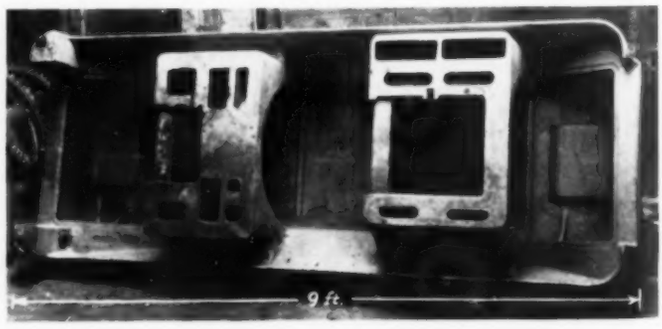
THE finest endorsement of any technical product is its use by men who are outstandingly successful in producing difficult work. The surest proof of its economy is in its widespread use. Ninety percent of the tankcar purchases are Linoil, and all through the industry for all classes of castings, down to the drum-a-year jobbing foundries, Linoil is the leading choice.

You can't go wrong on Linoil. It is the foundryman's friend and it never fails him. Chases worry and loss from bench, oven and mold. Makes hard work easy.



3350 lb. Motor Base and Pan, 4x9 feet, lightened throughout to 5 8" metal.

THE WERNER G.

The Foundry

Foundry Industry Moves Forward Confidently

AT THE close of the recent highly successful Milwaukee convention and exhibition, pride of accomplishment should belong to James L. Wick Jr., president, C. E. Hoyt, executive vice president and the other officers and directors of the American Foundrymen's association. Foundrymen everywhere are indebted to those men of vision and executive ability who conceived, planned and carried to a successful conclusion the recent demonstration of the virility of the foundry industry.

The thanks of all engaged in the manufacture of castings also should go to the manufacturers of foundry equipment and supplies who exhibited, to the authors of papers, discussion leaders, speakers, members of the Milwaukee chapter and their wives, and to the ranking officials of the city.

The Milwaukee convention has added inspiration to the feeling of confidence in the future of the foundry industry, a confidence born at Detroit in 1936. Foundries today, working at the highest rate in years, are taking the necessary steps to further increase production. Obsolete and worn out equipment is being replaced and the problem of developing an adequate supply of trained men is receiving proper attention. In the immediate future many problems must be solved by management, but the task will be easier because of the Milwaukee meeting.

Of Business Value

EXECUTIVE VICE PRESIDENT W. W. ROSE of the Gray Iron Founders' society is preparing an exceptional program for the annual meeting to be held in Cleveland, June 11 and 12. The meeting, to which all gray iron foundrymen are invited, will be devoted to discussions of problems of vital importance to the industry. With Washington seemingly anxious to increase governmental control over industry, it would seem that the gray iron foundryman who does not attend the coming meeting is neglecting seriously the welfare of his own business.

Give Him a Break

REMEMBER the buyers of castings, who stuck with you all during the depression, Mr. Foundryman? True, their orders were not large, but in all probability represented the total castings requirements of each company. At least, these orders permitted you to maintain a skeleton organization, which certainly came in handy when business began to pick up.

Today your plant is busy. In fact, you have orders for more castings than you can produce easily. Deliveries may have been falling just a little behind. Under these circumstances, what have you been doing for those good customers of some years standing? Complaints made to THE FOUNDRY indicate considerable dissatisfaction.

For numerous reasons, we believe it would be a worth while idea to check into these business friendships of long standing just to see if the old customers are getting the break they surely deserve.

Convention Reports

PUBLICATION of this number of THE FOUNDRY has been delayed a few days so that you may have reports of the many activities at Milwaukee. In spite of a larger number of editorial pages than has been included in any previous Post-Convention issue, the convention program was so extensive and the coverage by the editors has been so thorough that a few meeting reports must be held for the June issue.

Frank G. Steinebach
Editor

Milwaukee Convention To Meet Problems

H. Bornstein

INSPIRED by every detail of the 1937 foundry convention and exhibition, unsurpassed in point of excellence in the annals of the association, foundrymen of North America undoubtedly are in better position to meet the tremendous demands for greater production of castings. A convention so successful in all respects, cannot help but provide a welcomed impetus to an industry already moving ahead at high speed. Foundrymen from Boston, New York and Philadelphia in the East, to San Francisco and Los Angeles on the West coast—from the Canadian cities of the North to Birmingham and the industrial centers of the progressive South, returned home from Milwaukee with greater knowledge of the foundry industry's important problems.

Probably the most striking feature of the technical program was the increased attention given to various phases of management. Special stress was laid on furthering programs of apprentice training to meet the shortage of skilled men in the industry, on the efforts of the association and other closely related groups in the work of safety and hygiene in the foundry industry, on the need for the establishment of uniform cost methods if foundries are to realize a profit on the present rush of orders, and on the fundamentals of job

Marshall Post

James L. Wick Jr.

Inspires Industry Of Tomorrow

evaluation. Practically all technical sessions were exceptionally well attended and many produced some interesting and valuable discussions in addition to the formal papers. Once again the shop operating courses illustrated the importance of the informal interchange of practical information on practice problems.

Splendid entertainment was provided convention visitors by the men and women of the Milwaukee chapter committees. The ladies attending the convention enjoyed thoroughly the teas, style show, theater party, sightseeing trip and luncheon arranged by the ladies committee. The stag dinner on Tuesday evening, staged under the joint auspices of the Milwaukee chapter, the Foundry Equipment Manufacturers association and the A.F.A., was attended by 1245, the largest group of foundrymen and equipment and supply manufacturers ever to attend a single function. The foundrymen of Milwaukee and the surrounding territory graciously opened their plants to visiting foundrymen throughout the week, with special organized trips provided on Monday and Friday. A capacity crowd enjoyed the annual dinner, entertainment, and reception and dance on Thursday evening. Without a doubt, those in attendance at the 1937 convention and exhibition long will remember (*Please turn to page* 80)

C. E. Hoyt

R. E. Kennedy

D. M. Avey

40 50 60 70
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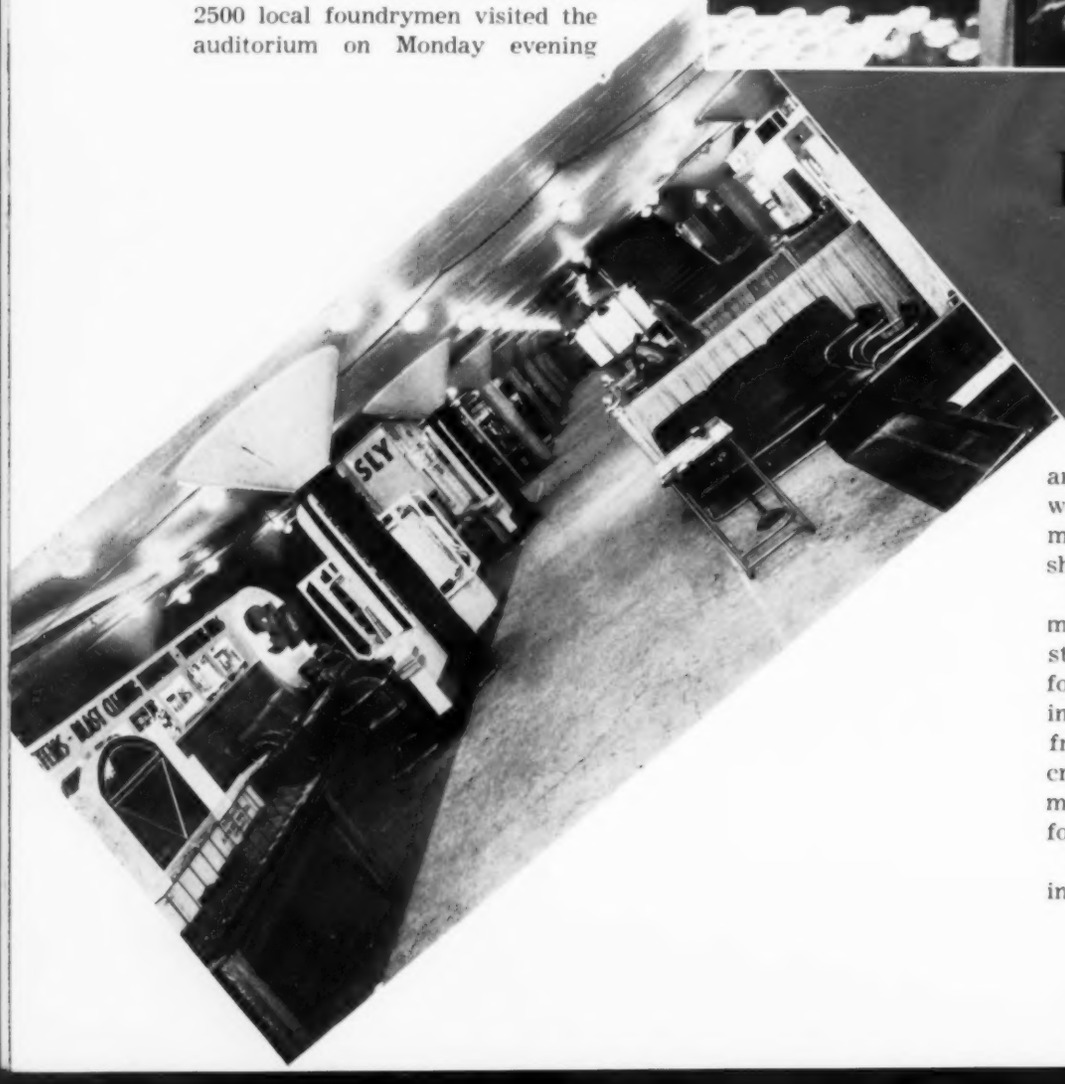
20 90
10 100
0 110
10 120
20
CORRECT TEMPERATURE

Exhibition Foundry

SUPERLATIVES are required to describe adequately the recent Milwaukee exhibition of foundry equipment and supplies, held under the auspices of the American Foundrymen's association and directed by C. E. Hoyt, executive vice president and manager of exhibits. From every standpoint, including attendance, interest, size, beauty of displays and sales of materials, the show held May 3-7, in connection with the forty-first annual convention of the association, was successful beyond expectations.

In several respects the exhibition differed considerably from the display of 1936. It was interesting to note that the individual booths appeared to be of a more uniform size, thus presenting a pleasing appearance and directing attention to all parts of the widespread exhibit. At the same time the artistry of a year ago was carried much further. Many companies provided exceptionally beautiful settings for their displays, thus adding to the artistic impression created in the minds of Milwaukee visitors.

Approximately 5250 registered members and guests visited the show, which is said to exceed all attendance records since 1930. In addition, about 2500 local foundrymen visited the auditorium on Monday evening and over 500 apprentices and students were admitted during the week, thus making the total attendance at the show in excess of 8000.



Exhibitors practically were unanimous in their praise of the show. All stated that interest on the part of foundrymen was exceptional, and that in addition much equipment was sold from the floor. Wide interest was created in a number of new developments which were shown in Milwaukee for the first time.

The latest developments in molding machines were shown in opera-

Stimulates Industry

tion and in wide variety by all the manufacturers of this type of foundry equipment. The Arcade Manufacturing Co., Freeport, Ill., had a total of four machines, two post type squeeze machines, one combined jolt and squeeze machine and one combined jolt rollover machine. This company also displayed flasks, jackets and a mechanical pouring device.

Beardsley & Piper Co., Chicago, had a large tractor type machine in operation on a special length of track. This machine prepares the sand and then delivers it through a rapidly revolving paddle which throws it with any required degree of force into any type flask or into pits on either side of the track and within reach of the revolving arm. The company also displayed sand handling, molding, and shakeout equipment.

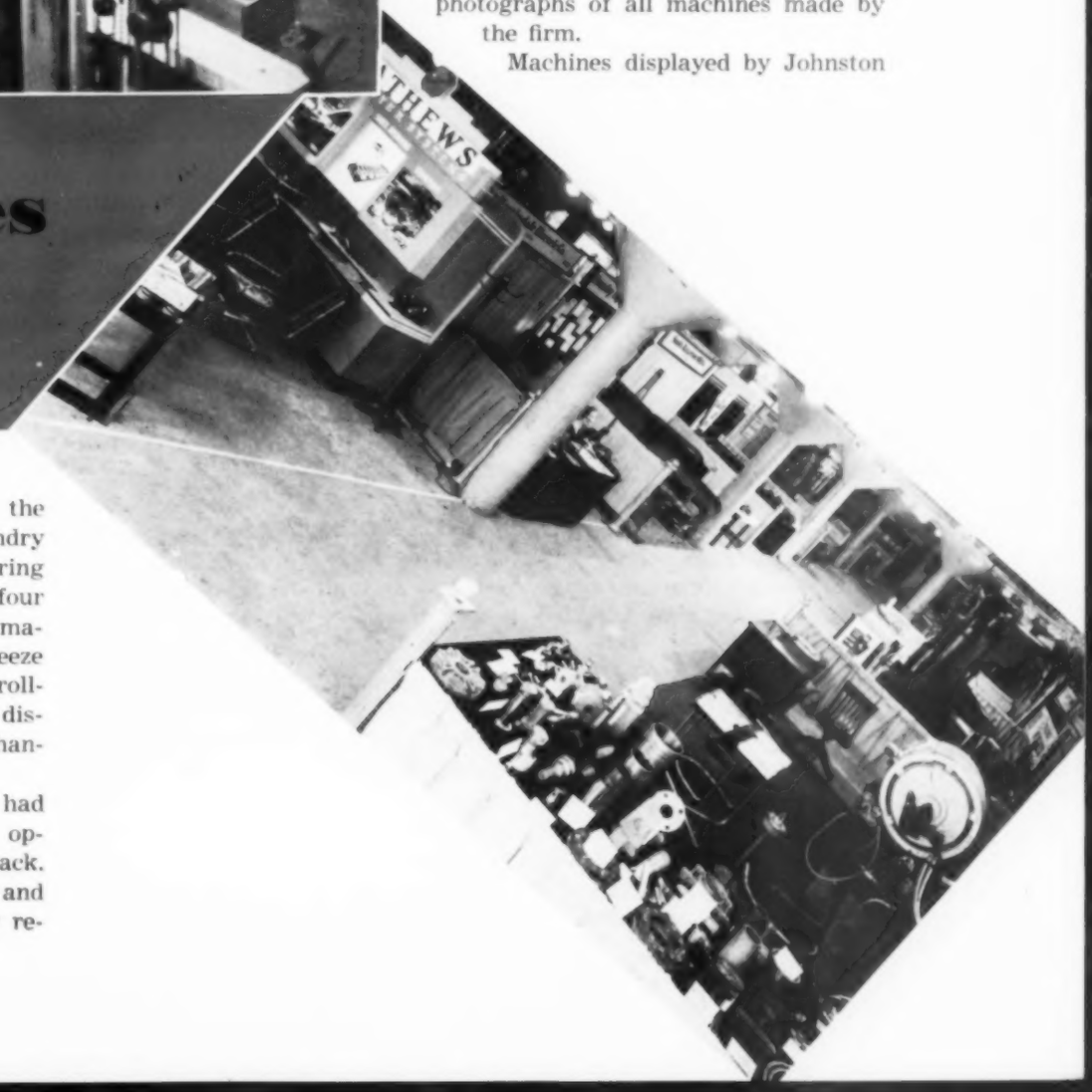
Champion Foundry & Machine Co., Chicago, showed a jolt squeeze and a hand rollover draw machine. In addition the booth was decorated by a large variety of enlarged photographs of other types of machines in operation.

Wm. Demmler & Bros., Kewanee, Ill., showed four different sizes of machines in which cores are made by driving the sand into the coreboxes with compressed air. The exhibit also included a wide variety of cores made by this process.

Three different types of pitless jolt rollover and pattern drawing machines were shown in operation by the Herman Pneumatic Machine Co., Pittsburgh. These machines were mounted on comparatively shallow bases and were demonstrated in action.

International Molding Machine Co., Chicago, displayed cores made on its machines, and also showed enlarged photographs of all machines made by the firm.

Machines displayed by Johnston



& Jennings Co., Cleveland, included a jolt rollover pattern draw, jolt squeeze, jolt squeeze pattern draw, plain jolt, jolt squeeze stripping plate. A new principle is incorporated in one of the machines by which the head may be locked in position rigidly, or shoved back out of the way.

Milwaukee Foundry Equipment Co., Milwaukee showed a complete line of molding machines, also a new type of rotary core grinder, and an automatic hydraulic briqueting press for handling turnings and borings.

Wm. H. Nicholls Co., Inc., Richmond Hill, Long Island, N. Y., operated three jolt squeeze machines, three jolt squeeze stripper type machines and an extra heavy jolt squeeze machine equipped with a run out roller table.

Osborn Mfg. Co., Cleveland, occupying extensive space near one end of the arena, showed typical machines in a wide variety of sizes and styles. Also a machine designed for making cores by driving sand into the coreboxes with compressed air.

In addition to an extensive list of molding machines of various types the Tabor Mfg. Co., Philadelphia, displayed an abrasive cutoff machine in which a thin abrasive disk revolving at high speed is employed for cutting gates, risers, etc., from castings.

Manufacturers of sand handling and other types of mechanical equipment employed in the foundry industry were well represented at the current exhibition. Allis-Chalmers Mfg. Co., Milwaukee, had a large shakeout screen, a small model of a sand bin with a vibrator attachment and control gate, a rotary type compressor, and newly developed adjustable speed, varied pitch v-belt drive. A paddle type sand mixer equipped with an overhead revolving screen and paddles arranged on a reverse spiral shovel system was shown in the booth of the Blystone Mfg. Co., Cambridge Springs, Pa. Another type of machine was displayed in action by the Clearfield Machine Co., Clearfield, Pa. In this machine a revolving pan carries the sand under a pair of rollers. A narrow wheel revolving at right angles to the rollers acts as a plow, raises the sand from the bed and throws it under the rollers.

A large new air cooled magnetic pulley, sectioned in places to show the various features was shown in the booth of the Dings Magnetic Separator Co., Milwaukee. Other pieces of equipment, magnetic drums and drum type separators, magnetic clutches and clutch couplings also were on display. A new type

riddle with all steel bottom and interchangeable screens, also a line of electric vibrators were shown by the Foundry Supplies Mfg. Co., Chicago.

Jeffrey Manufacturing Co., Columbus, O., had on display various pieces of equipment for the handling and preparation of molding and core sand. Also mold, flask and casting conveyors, core crushers, flask fillers and portable sand conditioners. Mechanical equipment for a similar line of duty was shown at the extensive booths of the Link-Belt Co., Chicago. The display also included an operating vibrating shakeout unit, anti-friction belt conveyor idlers and variable speed transmission worm gear and motorized reducer.

Following the custom of previous years the National Engineering Co., Chicago, had an extensive display of sand handling and preparation equipment. Muller type mixers were shown in various sizes from the small laboratory type unit, to one 8 feet in diameter. The large pan was mounted on a slant for the convenience of the spectators. Another unit was shown complete with auxiliary features including devices for removing roughage from the entering sand and also the removal of fines and dust.

Newaygo Engineering Co., Newaygo, Mich., had two mixers on display, one opened to show the paddles and the steel brushes by which the sand is mixed and aerated. Another motorized unit was designed to handle sand from the shakeout, throw all foreign material out by centrifugal force and exhaust the fines.

Show Sand Conditioning Units

Royer Foundry & Machine Co., Kingston, Pa., showed three different capacity machines in which sand is conditioned by throwing it upon a rapidly moving belt equipped with a great number of small projecting members. Roughage and foreign material are combed out and fall to the bottom by gravity while the cleaned and aerated sand is thrown in a stream from the top of the machine. A heavy duty shakeout and a portable screening unit were shown in operation by the Simplicity Engineering Co., Durand, Mich. Mixers, screens and elevating equipment arranged for either batch or continuous operation were displayed by the Standard Sand & Machine division of the National Engineering Co., Chicago.

Stearns Magnetic Mfg. Co., Milwaukee, showed magnetic separators for treating foundry sand. Items included magnetic pulleys, drum type separators, for purifying metal and separating minerals and ores. Sand and shakeout screens, and samples of woven wire cloth were shown by the W. S. Tyler Co., Cleveland. This company also had on display the nest of sand testing sieves adopted by the A. F. A., and a large illustration showing a sectional view of a long rotary drum employed for drying sand. Power operated gyratory riddles in several sizes were on display at the booth of the Great Western Mfg. Co., Leavenworth, Kans.

A number of exceptionally clean, solid castings were displayed at the booth of the Bethlehem Steel Co., Bethlehem, Pa. Grooved drums, gears, sleeves, pistons, auto blocks, valves, machine tool castings in which the thickness section varied to a considerable extent testified to the excellence of the raw materials. Other exhibits included fractured pig iron of various grades, and machined pieces of low phosphorus iron.

A large map on the back wall with lights showing location of various distributing centers was shown by the Hickman Williams & Co., Inc., Chicago. This company also had on display various types of alloy briquets, also loose quantities of the same materials in glass containers.

Pickands Mather & Co., Cleveland, had on display samples of iron ore, coal, pig iron and coke. A special type of coke for cupola use was on display on the booth of the Republic Coal & Coke Co., Chicago. Flasks and skids, pig iron and photographs of foundry floors were shown by the Republic Steel Co., Cleveland. A large map with colored pins on the back wall showed the location of the company's 40 plants in 27 cities. A large pile of valves and fittings illustrated the character of the iron used in their production.

Colored lights were used to illuminate a large illustration of the mixer ladle employed at the blast furnaces of the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala. Several enlarged photographs and a number of castings made from southern iron also were on display. The Wisconsin Steel Co., Chicago, with booth decorated in blue and chromium, showed the forepart of a steamer and the skyline of a steel plant. Flanking photographs showed steps in the manufacture of pig iron. A rack contained a number of fractured pigs with the corresponding analysis of each on a card.

Small Auxiliary Supplies

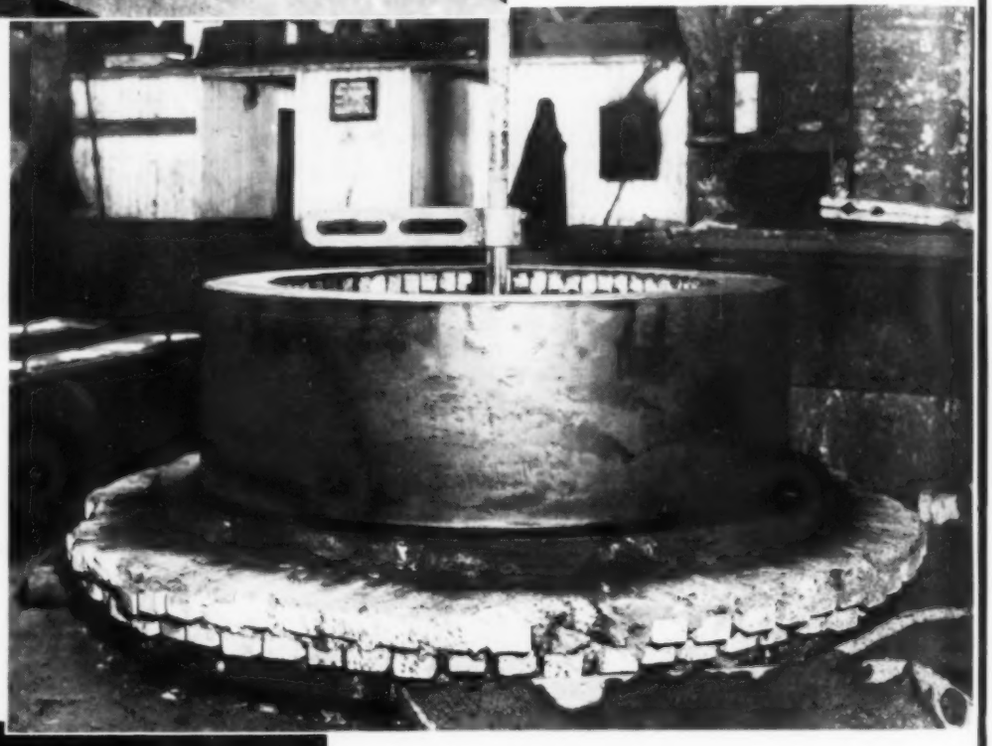
Chaplets and special small forms were shown in wide variety by the Combined Supply & Equipment Co. Inc., Buffalo, N. Y.; Milwaukee Chaplet & Mfg. Co., Milwaukee; Reeder Mfg. Co., St. Louis, Mo.; Smith & Richardson Mfg. Co., Geneva, Ill. Brass and iron two-way, three-way and four-way air operating valves in wide variety were displayed at the booth of the Galland-Henning Mfg. Co., Milwaukee.

Representative companies of the United States exhibiting molding sands, refractories, mineral products, etc., at the convention, presented a diversified and specialized picture of their developments during the past year, in addition to the regular line used in servicing foundries. Specialties were given more emphasis and a greater variety of unusual sizes indicative of wider application were in evidence. Illinois Clay Products Co., Joliet, Ill., celebrating its silver anniversary, presented samples of its fire clay and bond clay flours, fire brick, silica cement, ground fire clay and other fire clay products. Ironton Fire Brick Co., Ironton, O., showed its method of construction, installation and use of cupola blocks, ladle pouring brick and ladle bottom tile.

A variety of cores for castings such as cylinder heads, steam jets, reducers, gas furnace appliances, plumber's fittings, crankshafts, (*Please turn to page* 109)

Revamp

Fig. 1 (Left)—Seating and start of building a loam core. Fig. 2 (Below)—Loam core 76 inches diameter ready for drying. Fig. 3 (Bottom left)—Loam mold cheek with cores in place ready for finishing and drying



BUILDERS IRON FOUNDRY, Providence, R. I., is an institution dating back, well not quite back to the days of Roger Williams and the Providence Plantations on Narragansett Bay in New England, but as they say down East, back quite a ways. Back so far that men occasionally ask when, where and how the name originated.

Nearly 100 years ago in the rising young city of Providence, a certain young man, one Zachariah Chafee, calmly surveyed the industrial field and decided that a modest venture into the gray iron foundry industry might prove interesting and reasonably profitable. He was not a foundryman, but he was a clever man in the New England sense which means that he knew a hawk from a hand sawr, or the modern equivalent, he knew his way around.

For example, he knew that cast iron was going to be used extensively in building construction. Through natural increase and to a greater extent through floods of immigration destined for many years to pour into the country, the population was expanding at a remarkable rate. Expanding population meant expanding markets for all of the myriad commodities demanded by a restless and energetic people. Buildings would be required for manufacturing plants. Additional buildings would be needed for domestic use, for places of entertain-

Old Eastern Gray Iron Foundry

By PAT DWYER

ment, for divine worship, for education of the rising generation, for public service and for all other purposes to which buildings are adapted in large, civilized communities. The venture presented alluring possibilities.

In a word, if one may borrow a popular expression from the quaint vernacular of the period, the building industry was a natural, and seemed to present a steady and ever growing field for the absorption of castings.

Following the same line of thought — brevity and accuracy — the future young captain of industry decided that Builders Iron Foundry would be a highly appropriate title under which to start. Neat. Concise. Conservative. Meaning exactly what it said. No more. No less. A far cry indeed from the custom obtaining among the loquatious early inhabitants, from the flamboyant and garrulous spirit responsible for the wording of the charter issued to the Providence Plantations on Narragansett Bay in New England.

Cater To Diversified Market

Catering to the building industry long since has ceased to engage the major activities of the company, but through all the years and through all the changes, down to the present year 1937, the company has operated and still operates under the title Builders Iron Foundry. After serving as president for many years, the original Zachariah Chafee, founder of the company, was succeeded by his son Zachariah, present president, actively engaged in the management despite the fact that he is eight up on the traditional life span score of three score years and ten.

Essentially and always a general jobbing foundry, castings have been made here for almost every purpose and ranging in weight from a few ounces to 30 tons. For many years before the turn of the century, and before that type of armament became obsolete, the plant was one of the few in the United States engaged in the production of big guns—literal and not figurative—for the government.

Cupola iron was not considered good enough for these castings. The carefully selected iron was melted in air furnaces. Interesting sidelight on the progress of the foundry industry in recent years is shown in comparison between specified strengths.

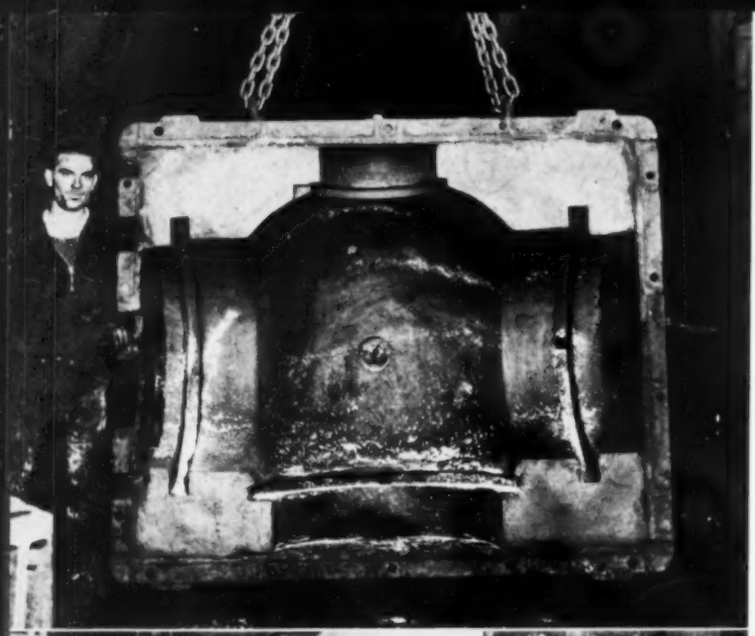
The government specified the air furnace as the melting medium, and a tensile strength of 30,000 pounds per square inch in the iron. This was considered the ultimate that could be attained. Today a tensile strength between 45,000 and 50,000 pounds per square inch, excites no comment. Comment is more likely to be aroused if the iron does *not* meet this standard!

Introduces Many Modern Features

General rearrangement of the plant a few years ago included the erection of two new cupolas, substitution of mechanical for hand charging, new yard layout, extension of building for light molding department, monorail system for distribution of metal and many minor auxiliary features in keeping with a modernization program.

Cupolas located on the outside of the end wall deliver metal to ladles suspended from a monorail in a section of the foundry connecting the two main divisions, one devoted to the production of heavy castings, and the other to the production of small and medium weight castings. The conventional charging platform in front of the cupolas on the outside of the building is not roofed over. It is not used in the ordinary manner for the storage of material, since each steel bucket containing a charge is loaded on the ground, lifted by a crane and inserted in the cupola where the bottom is released and the load discharged into the cupola. One man operating the crane in ease and com-

Fig. 4—General view of flask and storage yard showing bins for pig iron and scrap. Charges are made up and weighed on the scale near right center



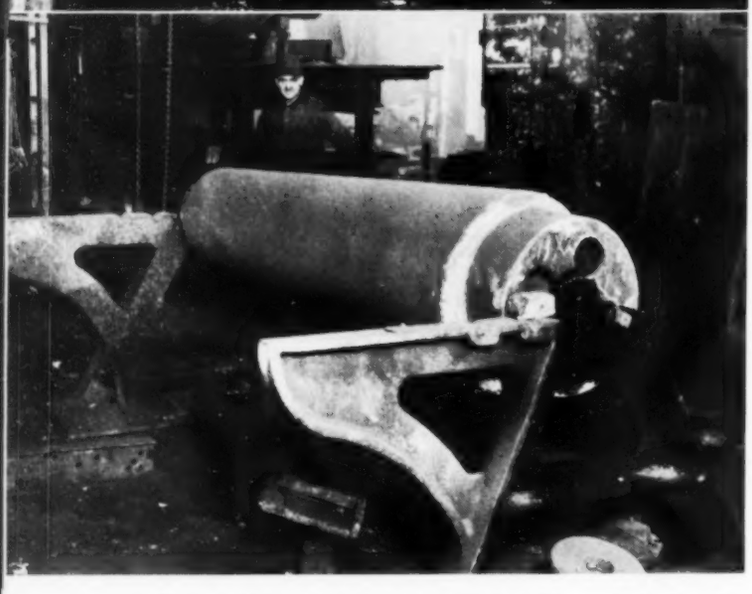


Fig. 5 (Above)—Cope of dry sand mold for 30-inch valve showing gates. Fig. 6 (Below)—Loam core for 24-inch diameter tube swept on cast iron arbor covered with hay rope

fort has replaced the usual charging crew engaged in that hot and laborious form of work.

Changing over to this system involved the erection of a crane runway over part of the rectangular yard enclosed by existing buildings. Also the erection of a steel framework over the remaining part of the yard and directly in line with the cupolas. The general arrangement is shown in Fig. 4, a view taken from the platform in front of the cupolas.

The main yard to the left served by a 10-ton crane is used for a variety of purposes. The space in the immediate left foreground is utilized as a shakeout station for the loam molds extensively employed in the foundry.

Under ordinary conditions a loam mold creates a considerable mess when it is shaken out and also pre-empts valuable space. This condition is intensified when orders for castings exceed the ordinary productive capacity of the shop and every foot of floor space is required for making the molds.

Under the present arrangement the molds are lifted by one of the cranes soon after the castings are poured. They are loaded on a buggy or more than one buggy if necessary, and taken out to the yard where the molds are knocked apart and the castings are removed. Large castings are cleaned in the immediate vicinity and then either shipped by truck, or taken into the adjoining machine shop for further attention. Cover plates, building rings, lifting and foundation plates for the loam molds are returned to the foundry if required for further immediate service. If not, they are stacked in the yard. Bricks are collected, cleaned, loaded in steel pans and returned to the various molding stations in the foundry. Periodically the burned sand, cinders and other rubbish are collected and loaded in a truck for removal to the dump. In this manner the molding floors in the foundry are kept clean, or as clean as reasonably might be expected where a great number of loam molds constantly are in various stages of construction.

Utilized for Storage Space

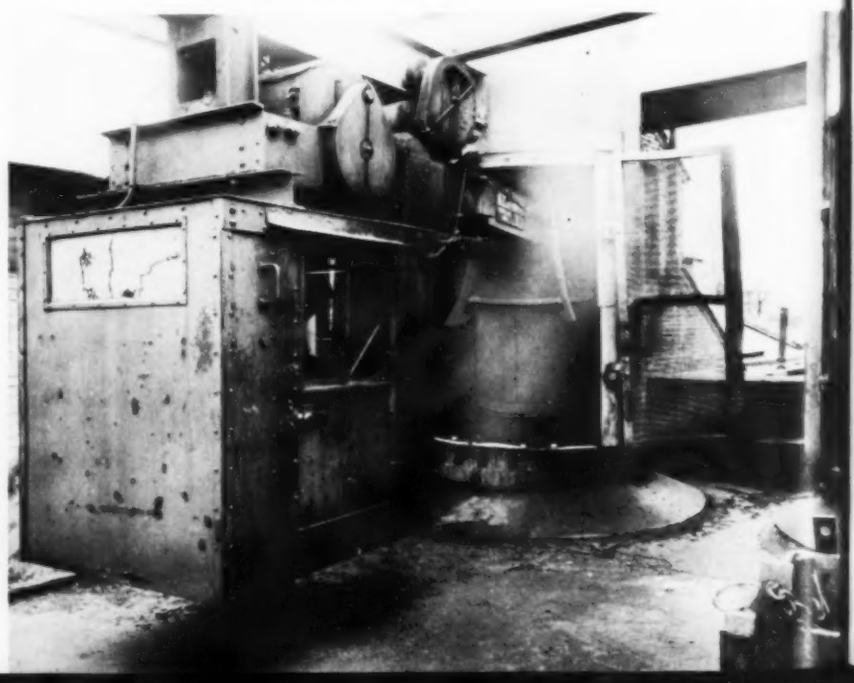
Remainder of the yard as far as a transverse central gangway, is utilized as a storage space for a wide variety of large cast iron flasks. From the central gangway to the opposite end of the yard the space is utilized for the storage of pig iron, scrap, coke and limestone, all separated by suitable partitions.

The crane hook is equipped for use either with a magnet or clamshell grab and thus readily may be employed for lifting the raw materials into the various bins, or, for removing the same materials in proper order, sequence and quantity and loading them into the steel buckets which convey them to the cupolas.

In the second main parallel division of the yard an upright steel frame supports two monorails, one leading to each cupola. Through a switch connecting both lines, the charging car shown in Fig. 7 may be diverted from one track to the other when such procedure is required.

In regular practice, the buckets are (*Please turn to page* 122)

Fig. 7—A charging crane lifts the bucket from the yard, places it in the cupola and discharges the contents



James T. MacKenzie

Charles W. Briggs

John W. Bolton

A. F. A. Presents Gold Medals

IN ACCORDANCE with the recommendation of the board of awards of the American Foundrymen's association, three medals recognizing achievement and service to the foundry industry were presented at the annual dinner, Thursday evening, May 6, held at the Schroeder hotel, Milwaukee, in connection with the annual convention and exhibition of the association.

This one of the association activities dates back to the Columbus, O., convention, 1920, when announcement was made that four prominent and veteran members of the association had each donated the sum of $5000, the income to provide an award to be conferred on certain individuals who, in the opinion of the board of awards, had made some notable contribution to the progress of the industry during the preceding year. Donors of the fund included J. H. Whiting; W. H. McFadden; W. S. Seaman and John A. Penton.

At the recent meeting, the John A. Penton medal was awarded to John Ward Bolton, Lunkenheimer Co., Cincinnati. The J. H. Whiting medal was presented to James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala. Charles Willers Briggs, U. S. Naval Research laboratory, Anacostia Station, Washington, was the recipient of the William H. McFadden medal.

John W. Bolton

John W. Bolton, born Terre Haute, Ind., 1897, received his technical training at Rose Polytechnic Institute from which he was graduated in 1918 with a B. S. in chemical engineering. He received his master's and professional degrees from the same school in 1921 and 1925 respectively. In industry he has served as chemist and metallurgist with the Proctor & Gamble Co., Cincinnati; Niles-Bement-Pond Co., and Black & Clawson Co., Hamilton, O.; and the Frank Foundries Corp., Moline, Ill. For the past 10 years he has been chief chemist and metallurgist for the Lunkenheimer Co., Cincinnati. Mr. Bolton has contributed many papers on original research to the technical press and before conventions of the A. F. A., and meetings of other associations. He was the author of the A. F. A. exchange paper presented at the 1925 meeting of the Belgian Foundrymen's association and in 1929 presented the A. F. A. exchange paper before the International Foundry Congress, in London, England. He is a member of several important committees in the American Foundrymen's association and in the American Society for Testing Materials. He has conducted extensive research and has published result of his findings on the cupola, slags, microscopy of cast iron, phosphorus in gray iron, carbon forms in gray iron, mechanical properties of gray iron, and many other topics. Mr. Bolton is the author of *Gray Cast Iron*, recently pubished by the Penton Publishing Co., Cleveland and is a member of the Editorial advisory staff of THE FOUNDRY.

Charles W. Briggs

Charles W. Briggs, recipient of the W. H. McFadden medal, received his early education in the schools of California and was granted the degree of Engineer in Physical Metallurgy from Stanford university. Later he was employed as research metallurgist for the Standard Oil Co., and Pacatome Ltd., San Francisco. For the past several years he has been physical metallurgist with the United States Naval Research laboratory, Anacostia, D. C. He has been actively connected with research work on steel castings, and has presented papers on this subject before conventions of the A. F. A. He also has appeared before the American Society for Metals; American Society of Naval Engineers; and other associations with papers dealing with steel castings, heat treatment, radiography and physical metallurgical subjects. In addition to the A. F. A., he is a member of the A. I. M. E.; A. S. M.; and A. S. M. E.

James T. MacKenzie

James T. MacKenzie, awarded the J. H. Whiting medal was born in Brookeville, Fla., in 1891. He was graduated from the University of the South, Sewanee, Tenn., in 1912 and shortly (*Please turn to page* 144)

THE MOLDER

Photographed by
L. B. KELLER

A NICE degree of artistic appreciation in addition to photographic skill of a high order are shown in the accompanying illustration of a molder engaged in part of his routine duty, pouring molten metal into a mold. The photograph was taken in a local foundry by L. B. Keller, 1135 Marine avenue, Clearwater, Fla. Injured in an airplane crash over a year ago, Mr. Keller while convalescing took up photography as a hobby and rapidly moved into the front rank.

This picture, titled *The Molder*, was accorded an honor and hung in photographic salon contests in competition with hundreds of the nation's outstanding pictures that had taken prizes and been awarded honorable mention wherever they were shown. Recently the picture has been accepted for salon exhibition at the Portland Society of Art, Portland, Me., where it was on exhibition from April 11 to May 9.

Mr. Keller comes from a family of foundrymen. His father for many years was connected with the Ideal Furnace Co., Detroit and the Homer Furnace and Foundry Co., Coldwater, Mich. His brother has been foundry superintendent of the latter company for the past 17 years. Mr. Keller at one time worked as a molder in both plants.

Copper Has Beneficial Effect On Cast Iron Properties

By V. H. SCHNEE
Research Engineer,
Battelle Memorial Institute, Columbus, O.

USE of copper alloy cast iron is extending rapidly into a great variety of engineering applications. The relatively low cost of copper, coupled with its ready availability and easy introduction into cast iron has made this old well known metal of long standing interest to the cast iron foundrymen, but it is only recently that the real improvement in the properties of cast iron that can be obtained with copper has been recognized.

The greatest commercial use of copper alloy iron has been made by one of the large automobile manufacturers who alone, in 1936, produced some 250,000 tons of iron containing from 0.5 to 3.0 per cent copper. More than half of this production was used for such typical foundry products as cylinder blocks and flywheels, containing from 3.15 to 3.60 per cent carbon, 1.40 to 2.10 per cent silicon, and from 0.5 to 1.00 per cent copper. Special copper alloy irons, containing up to 3.00 per cent copper are used for cast crank shafts, camshafts, and other parts requiring heat treatment. Two hundred fifty thousand tons of copper alloy iron is a startling figure. It places copper in a recognized position as an important alloying element for cast iron. However, this is not the only use for copper alloy cast iron, as many foundries throughout the country are producing various types of castings containing copper for many different applications.

Characteristics of Copper

Copper alloys readily with cast iron; its melting point is several hundred degrees below that of iron. No oxidation losses occur when copper is charged to the cupola. Baled wire and sheets, ingots and scrap copper are charged directly, while clipped wire or copper shot usually is used for ladle additions. Either method of adding copper is satisfactory. Solubility of copper in molten cast iron is about 5 per cent, depending to some extent on the carbon content. In practice, the usual copper addition is from 0.25 to 3.0 per cent. In general, copper increases the fluidity of cast iron and improves its casting qualities. It hardens the matrix, refines the graphite, and closes the grain or *tightens* the iron. It is used similarly to nickel to control the chill, and in this way improves the machinability of the lower silicon irons.

Small amounts of copper long have been used to improve the resistance of iron and steel to atmospheric corrosion. Copper is known to improve the resistance of cast iron to certain types of chemical corrosion, for example, 1.00 to 2.00 per cent copper increases the re-

Table I

Properties of Some Electric Furnace Copper Cast Irons

Composition of Cast Iron						Mechanical Properties			
						Brinell Hardness	Tensile† strength lb./sq. in.	Transverse	
C	Si	Mn	S	P	Cu			Load*	Deflection
2.62	1.9	0.84	0.04	0.43	....	235	46,500	3100	0.275
2.62	1.9	0.84	0.04	0.43	1.04	259	48,000	2800	0.183
2.62	1.9	0.84	0.04	0.43	2.11	268	50,000	2720	0.168
2.98	2.2	0.79	0.04	0.41	....	225	38,500	2830	0.250
2.98	2.2	0.79	0.04	0.41	1.07	225	40,000	2680	0.233
2.98	2.2	0.79	0.04	0.41	2.07	241	46,000	2740	0.231
3.18	2.24	0.62	0.03	0.11	0.21	167	34,500	2200	0.263
3.18	2.24	0.62	0.03	0.11	1.20	183	37,500	2500	0.266
3.18	2.24	0.62	0.03	0.11	2.20	226	38,000	2600	0.264
3.39	1.59	0.58	0.03	0.15	....	180	29,400	2210	0.302
3.39	1.59	0.58	0.03	0.15	1.57	212	33,700	2420	0.260
3.39	1.59	0.58	0.03	0.15	3.06	220	36,700	2600	0.281

*Transverse bars 1.2-inch diameter tested on 18-inch centers.
†Tensile bars machined from broken transverse bars.

Table II

Properties of Some Cupola Copper Cast Irons

Composition of Cast Iron						Mechanical Properties			
						Brinell Hardness	Tensile† strength lb./sq. in. Green Sand	Transverse	
C	Si	Mn	S	P	Cu			Load*	Deflection
3.45	1.18	0.71	0.08	0.24	0.48	210	32,930	2660	0.291
3.52	1.13	0.66	0.10	0.22	0.78	219	34,430	2507	0.288
3.34	1.11	0.53	0.10	0.24	2.67	260	36,430	2520	0.228
3.25	1.12	0.51	0.10	0.24	3.05	255	42,030	2530	0.217
3.46	1.13	0.61	0.10	0.24	3.48	268	41,360	2150	0.198
3.59	1.50	0.48	0.09	0.26	0.25	187	28,366	2193	0.282
3.52	1.52	0.47	0.09	0.27	0.81	203	30,166	2170	0.242
3.46	1.43	0.47	0.09	0.27	1.48	212	30,766	2357	0.247
3.53	1.45	0.39	0.09	0.26	1.72	217	33,166	2403	0.237
3.48	1.46	0.44	0.09	0.25	3.05	238	35,900	2370	0.230
2.89	1.87	0.52	0.14	0.07	0.56	277	51,600	3117	0.232
3.02	1.57	0.43	0.14	0.03	1.30	296	57,166	3243	0.239
2.87	1.86	0.60	0.14	0.07	1.48	286	47,633	2913	0.197
2.99	1.58	0.42	0.13	0.03	2.48	302	58,600	2973	0.218
2.94	1.84	0.52	0.12	0.03	2.79	321	59,450	2981	0.217
2.89	1.79	0.52	0.12	0.03	3.95	321	62,650	2810	0.210
3.41	2.59	0.56	0.10	0.26	0.38	212	32,166	2430	0.291
3.32	2.56	0.58	0.10	0.26	0.89	220	34,066	2420	0.251
3.44	2.52	0.58	0.10	0.26	1.56	234	34,966	2397	0.238
3.41	2.50	0.57	0.10	0.26	2.44	249	37,466	2430	0.224
3.36	2.46	0.59	0.10	0.26	3.74	253	34,933	2453	0.232

*Transverse bars 1.2-inch diameter tested on 18-inch centers.
†Tensile bars machined from broken transverse bars.

sistance of cast iron pipe to corrosion by hot crude oil, and copper bearing cast irons are used quite generally in mine waters. Sufficient service history has not been accumulated as yet to warrant a general statement on the value of copper cast iron for other specific applications. The influence of copper on the properties of cast iron has been reviewed in detail by Gregg and Daniloff[1], and by Hurst[2].

Typical automotive parts made from plain copper alloy iron have been described by McCarrol and McCloud[3]. Cylinder blocks are made from an iron containing 3.15 to 3.40 per cent carbon, 1.80 to 2.10 per cent silicon, and from 0.5 to 0.75 per cent copper. They state that copper is used to control the chill in thin sections, to tighten the structure, and to improve the machinability and wear resistance of the iron. Fly wheels are made from an iron containing 3.30 to 3.60 per cent carbon, 1.40 to 1.80 per cent silicon, 1.0 to 1.25 per cent manganese, and from 0.5 to 0.75 per cent copper.

Copper is used principally to *close* the grain of the iron, and thereby improve machinability. Push rods are made by chill casting in permanent molds. The iron contains only 0.30 to 0.65 per cent silicon, with 0.15 to 0.50 per cent manganese, 3.60 to 3.90 per cent carbon, and 0.75 to 1.0 per cent copper. The copper is used to give the matrix the necessary toughness to offset the brittleness of the white iron. These parts are heat treated to remove casting strains.

The effect of copper on the mechanical properties of some electric furnace cast irons is shown in Table I. These data have been taken from unpublished work by Lorig at the Battelle Memorial institute[4].

The effect of copper on cupola irons containing different amounts of carbon and silicon is shown in Table II. These values are taken from an extensive investigation of the effects of copper and copper manganese combinations on cast iron by Eastwood, Bousu and Eddy[5].

These data have been selected to illustrate the effect of copper on irons of different silicon and carbon contents. Conclusions given in the report, which are based on a total of 120 compositions tested are "that copper increases hardness, compressive strength, and tensile strength, but that it has a slight adverse effect upon the transverse properties. The copper promotes graphitization and decreases chill in low silicon irons, has no effect on these properties when the silicon is 2.0 per cent, and it increases chill and retards graphitization slightly when the silicon is above 2.5 per cent. Both the fracture and the graphite flakes are refined by copper; (*Please turn to page* 127)

Table III

Properties of Some Electric Furnace Copper Nickel Cast Irons

Composition of Cast Iron							Mechanical Properties			
							Brinell Hardness	Tensile† Strength lb./sq. in.	Transverse	
C	Si	Mn	S	P	Cu	Ni			Load*	Deflection
2.62	1.9	0.84	0.04	0.40	....	....	235	46,500	3100	0.275
2.62	1.9	0.84	0.04	0.40	....	0.96	235	46,000	3300	0.262
2.62	1.9	0.84	0.04	0.40	....	1.88	257	49,000	2660	0.185
2.62	1.9	0.84	0.04	0.40	1.04	....	259	48,000	2800	0.183
2.62	1.9	0.84	0.04	0.40	2.11	..	268	50,000	2720	0.168
2.62	1.9	0.84	0.04	0.40	0.28	0.81	245	48,000	2970	0.208
2.62	1.9	0.84	0.04	0.40	0.52	1.49	255	47,000	2920	0.195
2.62	1.9	0.84	0.04	0.40	1.05	0.59	255	45,000	2770	0.179
2.62	1.9	0.84	0.04	0.40	1.58	0.64	264	49,500	2820	0.168
2.62	1.9	0.84	0.04	0.40	1.06	1.17	262	49,000	2560	0.162
2.98	2.2	0.79	0.04	0.40	....	....	225	38,500	2830	0.250
2.98	2.2	0.79	0.04	0.40	....	1.01	225	40,500	2880	0.260
2.98	2.2	0.79	0.04	0.40	....	1.99	233	44,000	2884	0.243
2.98	2.2	0.79	0.04	0.40	1.07	....	220	40,000	2680	0.233
2.98	2.2	0.79	0.04	0.40	2.07	....	241	46,000	2740	0.231
2.98	2.2	0.79	0.04	0.40	0.44	0.66	232	38,000	2670	0.238
2.98	2.2	0.79	0.04	0.40	0.48	0.96	234	43,000	2740	0.233
2.98	2.2	0.79	0.04	0.40	0.56	1.47	243	46,500	2690	0.222
2.98	2.2	0.79	0.04	0.40	1.10	0.50	238	43,500	2970	0.202
2.98	2.2	0.79	0.04	0.40	1.58	0.50	243	45,500	2930	0.241
2.98	2.2	0.79	0.04	0.40	1.03	0.94	242	40,500	2960	0.245
3.06	1.9	0.85	0.04	0.49	....	....	227	40,000	2760	0.231
3.06	1.9	0.85	0.04	0.49	....	1.01	229	40,500	2620	0.260
3.06	1.9	0.85	0.04	0.49	....	1.94	237	40,500	2660	0.244
3.06	1.9	0.85	0.04	0.49	1.15	....	232	41,500	2630	0.217
3.06	1.9	0.85	0.04	0.45	2.21	....	242	40,500	2560	0.220
3.06	1.9	0.85	0.04	0.49	0.52	0.41	220	41,000	2650	0.225
3.06	1.9	0.85	0.04	0.49	0.55	0.90	229	41,500	2750	0.235
3.06	1.9	0.85	0.04	0.49	0.49	1.53	232	42,500	2490	0.221
3.06	1.9	0.85	0.04	0.49	1.04	0.50	229	43,000	2790	0.248
3.06	1.9	0.85	0.04	0.49	1.51	0.50	240	44,000	2650	0.221
3.06	1.9	0.85	0.04	0.49	1.00	0.86	232	43,500	2860	0.255

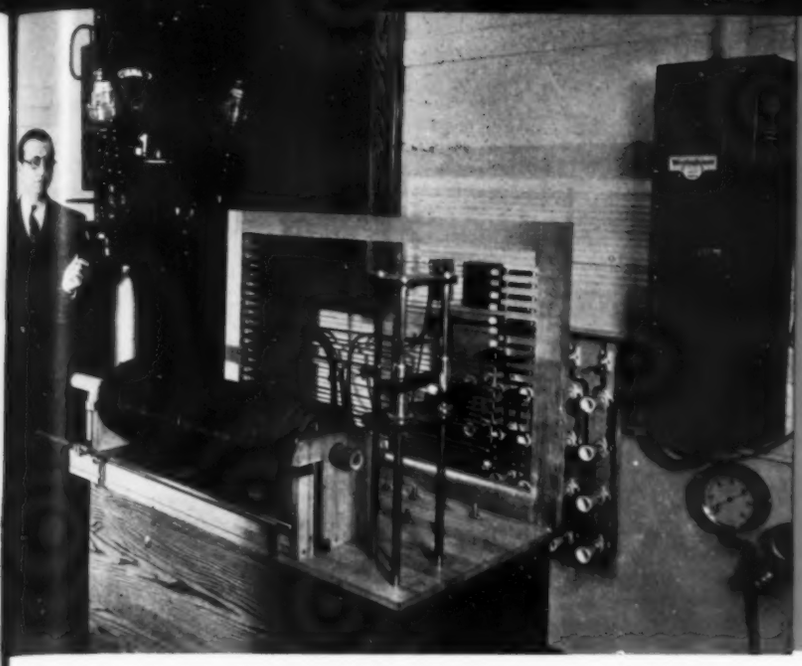
*Transverse bars 1.2-inch diameter tested on 18-inch centers.
†Tensile bars machined from broken transverse bars.

Table IV

Mechanical Properties of Some Cupola Copper Manganese Cast Irons

Composition of Cast Iron						Mechanical Properties			
						Brinell Hardness	Tensile† Strength lb./sq. in.	Transverse	
C	Si	Mn	S	P	Cu			Load*	Deflection
3.56	1.10	0.64	0.10	0.15	0.21	205	32,836	2356	0.301
3.46	1.12	0.62	0.09	0.15	0.33	207	32,993	2406	0.267
3.47	1.07	0.87	0.10	0.15	0.67	217	35,893	2435	0.238
3.27	1.07	1.15	0.09	0.16	1.06	239	38,900	2550	0.239
3.58	1.01	1.34	0.09	0.15	2.25	269	44,610	2470	0.202
3.25	1.38	0.64	0.08	0.26	0.16	210	34,206	2263	0.177
3.33	1.43	0.80	0.08	0.26	0.64	228	37,366	2592	0.230
3.44	1.43	0.90	0.08	0.26	0.84	230	38,860	2450	0.218
3.34	1.36	1.34	0.08	0.23	1.54	255	42,300	2418	0.195
3.32	1.41	1.28	0.08	0.25	1.49	256	42,896	2442	0.190
2.97	1.50	0.69	0.11	0.13	0.13	225	38,650	2655	0.239
2.99	1.55	0.66	0.11	0.13	0.18	231	39,300	2635	0.259
2.88	1.55	0.98	0.11	0.13	1.10	258	44,595	2853	0.226
2.99	1.50	1.26	0.09	0.13	1.63	286	45,050	2750	0.202
2.98	1.49	1.65	0.09	0.13	1.84	289	44,680	2767	0.189
2.97	1.49	1.61	0.09	0.14	2.16	300	48,000	2575	0.175
3.32	2.35	0.69	0.10	0.25	0.19	217	35,026	2323	0.257
3.24	2.32	0.84	0.08	0.25	0.46	225	35,943	2253	0.225
3.23	2.28	0.88	0.08	0.25	0.94	241	37,286	2427	0.220
3.20	2.29	1.34	0.07	0.25	1.43	255	38,793	2300	0.205
3.18	2.20	2.01	0.07	0.24	3.03	286	39,096	2533	0.180

*Transverse bars 1.2-inch diameter tested on 18-inch centers.
†Tensile bars machined from broken transverse bars.



Speeding Up Metal Analysis

By ALFRED WALDCHEN

Fig. 1—Iron to be analyzed is volatilized in a damped spark circuit operating at 40,000 volts

This article is abstracted from the February issue of the Michigan Technic published by the College of Engineering, University of Michigan, Ann Arbor, Mich., where the author is a student.

DURING the past decade a vast amount of scientific data has been accumulated with only a small fraction finding applications in industry. Until recently the scientific material available on the spectrum and spectroscopy has been included in that great body of material which has found too little industrial application.

The department of engineering research of the University of Michigan recently has sponsored active investigation in this field. The result of this research is the perfection of a spectrographic method by which the quantitative analysis of alloy cast iron may be accomplished. This work was done by Dr. H. B. Vincent, of the department of engineering research, in collaboration with Prof. R. A. Sawyer of the physics department of the University of Michigan.

Laboratory in Foundry

A method of analysis was first developed at the university. Then a similar set-up was installed at the plant of the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., where it was put into successful operation by A. M. Sampson of that company, who also participated in the development work at the university.

The particular conditions met in the routine production control of alloy cast iron have been the chief impetus in the perfection of this method of analysis. The production of cast iron is a relatively continuous process. Scrap iron of widely varying composition is dumped in at the top of the cupola so that it is difficult for the operator of the furnace to hold exactly to the specified composition.

If castings of specified composition are to be produced, it is desirable to analyze the molten iron while still in the cupola, so that necessary corrections in the melt can be made before the metal is poured. If analysis is made by chemical means, the elapsed time is so long that serious changes in composition of the molten iron alloy may occur. Spectrographic analysis has reduced the time between taking of the sample and posting of results so that little change in composition occurs during the analysis period.

Principles of this method of determining the constituents of alloy cast iron are not exceedingly complicated. The cast iron being analyzed must be volatilized and heated to luminescence in some manner. This is done by inserting small cast cylinders of the iron in a damped spark circuit operating at 40,000 volts. The spark reaches temperatures far above that at which the alloy vaporizes. At these high temperatures the vapor is luminescent and emits light characteristic of each constituent of the alloy.

A Bausch & Lomb Optical Co. Littrow spectrograph is used to record these emissions. The light rays pass through a prism in this apparatus and are dispersed and photographed. Spectral lines characteristic of each element present in the vaporized iron alloy, appear in definite relative positions on the photographic plate. With the aid of microphotometer, suitable measurements and calculations on the density of these lines may be made to determine the percentage of each constituent in the alloy.

The way in which the vaporization and excitation of the iron is accomplished has an important bearing on the accuracy of the results obtained. Obviously it is essential that a source be used which will give identical results with repeated tests on samples of the same melt. Several methods were tried and two appeared promising. One of these methods was a 25 ampere direct current arc using a graphite cathode and a rotating cylindrical iron alloy anode. The other method, which is the one in use at present, is a damped spark operating at 40,000 volts.

About one kilowatt of power is consumed in the spark circuit. This setup is capable of analyzing for the following elements in the ranges given:

Cr.	0.10-1.50%	Mo.	0.09-1.25%
Cu.	0.20-3.00%	Ni.	0.10-2.00%
Mn.	0.35-1.25%	Si.	0.50-4.00%

The outside ranges on (*Please turn to page* 130)

Annealing Time Is Reduced To

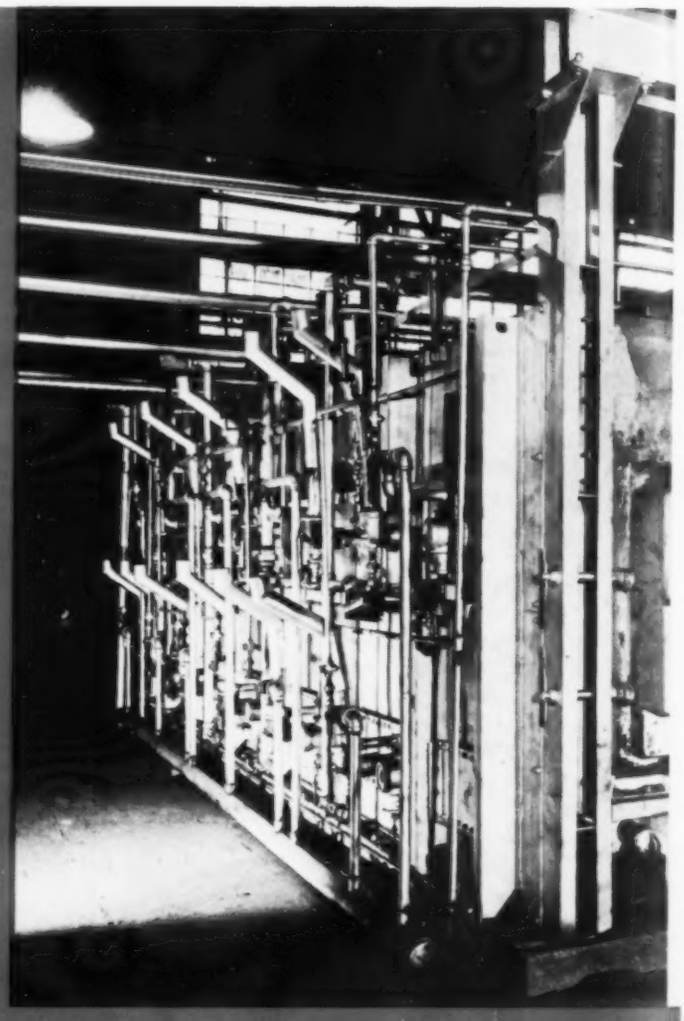
IN THE production of malleable cast iron a considerable period elapses between the time the casting is made and the time it is ready for delivery to the purchaser. That interval is occupied mainly with the annealing or heat treatment operation, which converts the original, relatively brittle, white iron casting into one which is malleable, tough and has a velvety, black fracture.

The annealing process in the ordinary malleable foundry occupies from 6 to 7 days. As might be expected, considerable thought and effort have been given to developing ways and means whereby that time could be reduced. Application of an elevated, electrically heated furnace and a cycle whereby the metal charge is removed from the furnace to promote rapid cooling during part of the annealing, has resulted in a shortening of the period. Perhaps the greatest saving of time has been secured with the tunnel-kiln type of furnace.

Application of Tunnel Type Limited

However, since that type of furnace must be operated continuously, its use is limited to foundries with large production schedules. Consequently, the malleable cast iron foundry, due to its relatively limited production, must rely upon the batch type furnace or oven for annealing its product. However that has not deterred the search for developments which will result in shortening the annealing time. Essentially, the annealing period can be divided into five distinct intervals, namely, heating to the maximum temperature; maintaining the maximum temture until equilibrium in the graphitization of cementite is attained; cooling to the critical point; holding just under the critical point until equilibrium again is established, and further cooling to permit handling.

Improvements in furnace construction and heat distribution have reduced the time required for reaching the maximum temperature. Elimination of annealing pots by employing muffle-type furnaces also



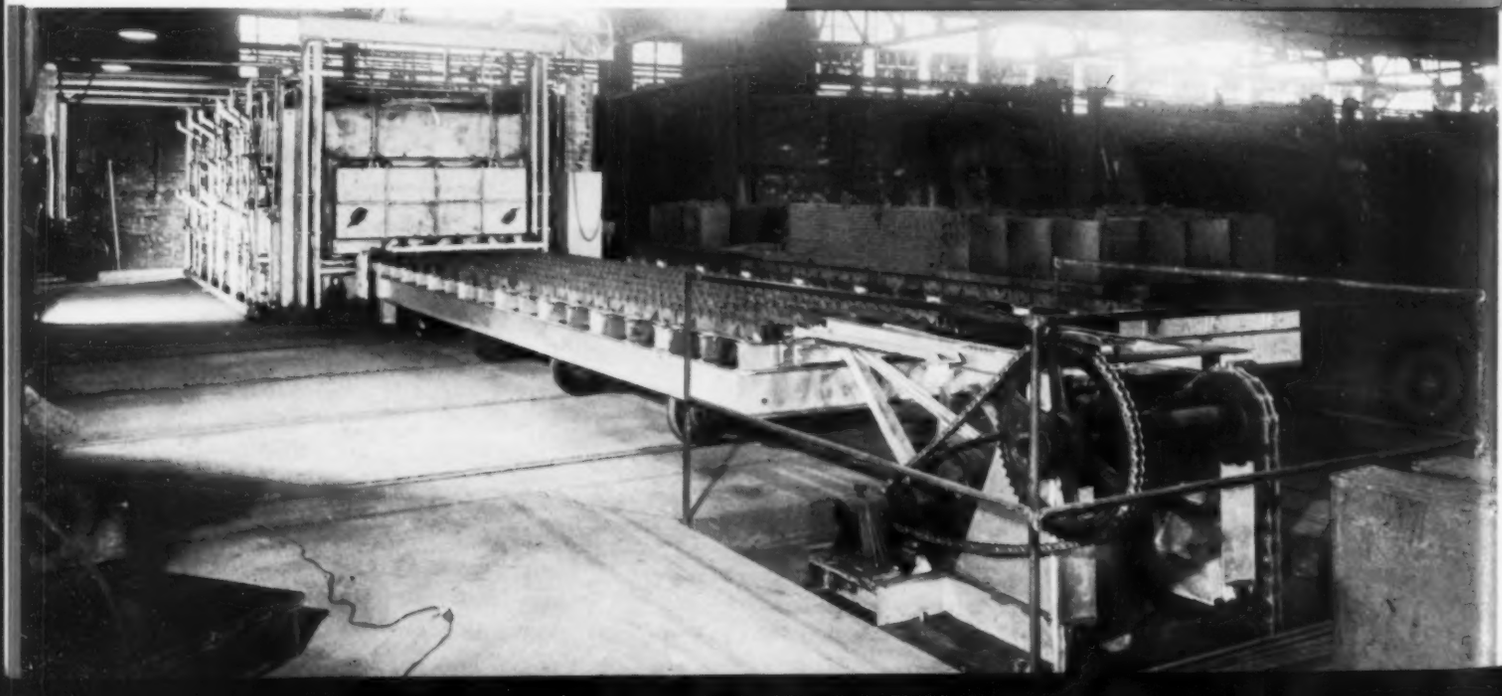
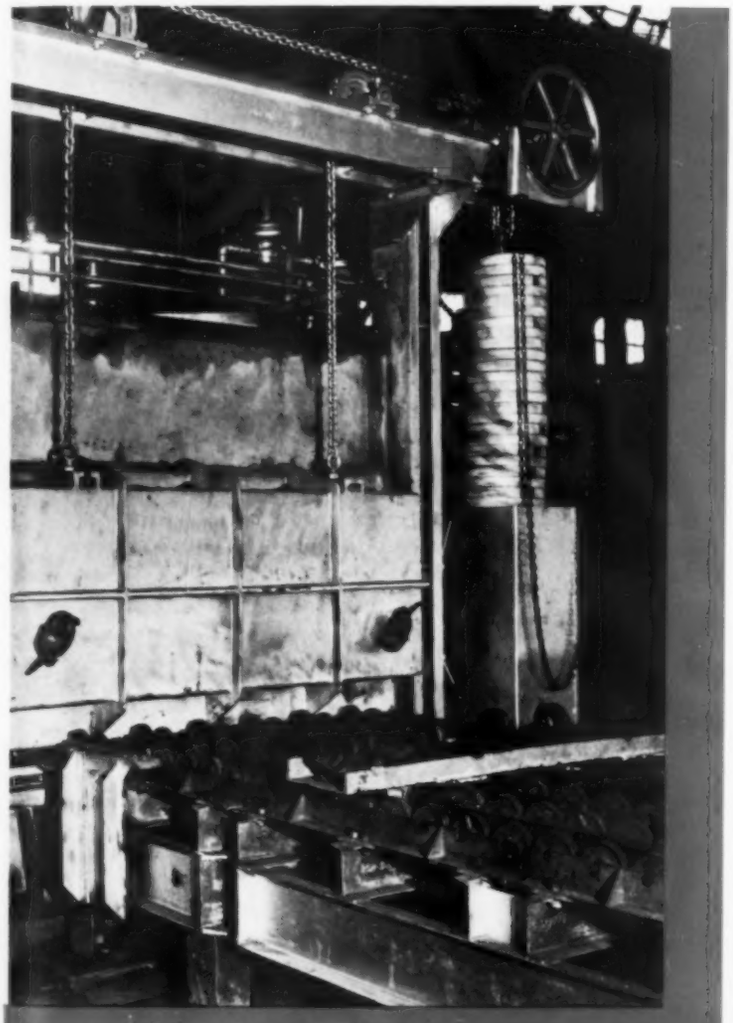


Fig. 1 (Below)—View of the furnace showing empty transfer car and chain drive mechanism. Fig. 2 (Right above)—Alternate tubes are fired from opposite sides of the furnace

For Malleable 45-50 Hours

By EDWIN BREMER



has aided in shortening that time and in reducing the period for holding at the maximum temperature. While those and some other investigations on composition and temperatures have resulted in cutting the annealing time in the batch type furnace, it is believed that further reduction can not be accomplished through those means because of limitations imposed by attaining equilibrium in graphitization of cementite, and equilibrium just below the critical point. Naturally, if equilibrium is not established at those transformation points the final product is not satisfactory.

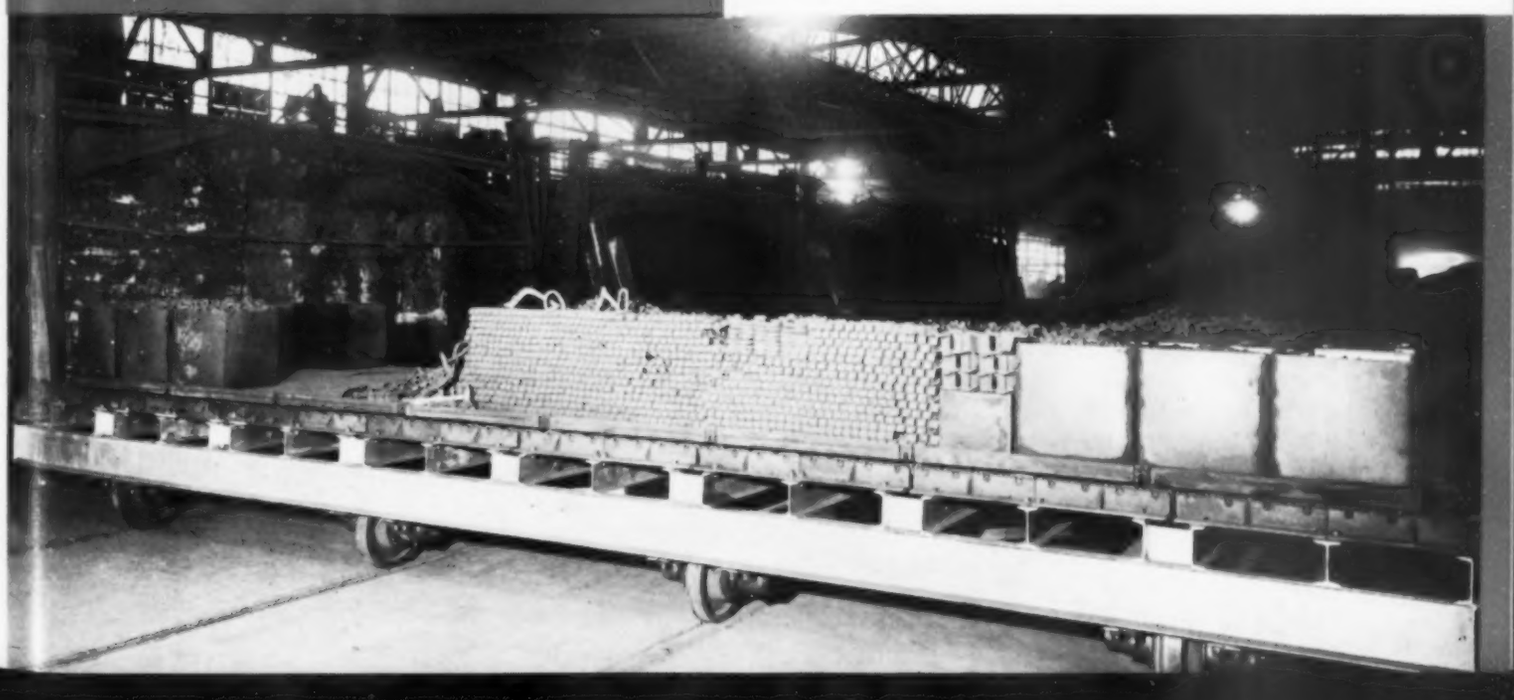
With the approach through these avenues being practically closed to attaining a reduction in annealing cycle, one possibility of further attack on the problem is left, and that is through the interval of cooling from the cementite graphitication equilibrium to the critical point. That phase like the others has been hedged in with limitations until comparatively recently. The essential limitations have been that the castings at high temperature can not be exposed to the atmosphere without scaling, and that cooling through the critical range must be extremely slow to attain equilibrium.

Furnace Divided Into Zones

In the tunnel-type annealing furnace these limitations were circumvented by airlocks at the entrance, and by dividing the furnace into zones in which the temperature could be controlled with reasonable accuracy. In a recently completed installation of the tunnel-type furnace, heating is accomplished through radiant tubes of a heat-resisting alloy, and in addition to the airlocks, the atmosphere in the furnace is controlled to prevent scaling and to provide a definite concentration of both carbon dioxide and carbon monoxide so that transformations of the carbon will proceed as rapidly as possible.

That furnace with its type of construction, and methods of control, attracted the attention of John Wagner, president, Wagner Malleable Iron Co., Decatur, Ill., who had been engaged in a study of methods of shortening the an- (*Please turn to Page* 133)

Fig. 3 (Below)—Loaded transfer car ready for annealing



QUESTIONS and ANSWERS

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Large Chilled Sprocket Wheel Develops Cracks on Rim

We have had considerable trouble with cracking in large chilled cast iron sprocket wheels, particularly with wheels where the hubs are out of proportion to the rim. Sometimes the wheels do not crack until the day after they have been poured. We have tried stripping the hubs and removing the center core. In some instances this helped. We shall appreciate any information on proper mixtures of iron, or manipulatio to produce satisfactory castings.

Cracking is a common form of trouble in all wheels where the hub or the hub and arms are out of proportion to the rim. The comparatively light rim cools first and contracts. Later the hub and arms contract and naturally the casting breaks at the weakest point. In the case of a wheel where the rim is chilled, this condition is accentuated since the rim cools much more rapidly than where the rim merely is in contact with sand.

The first remedial measure is to cool the center as soon as possible as you have done by digging the sand away in the vicinity and removing the center core. Unfortunately this always cannot be done soon enough, since the rim cools very rapidly, and the sand cannot be removed from the outside and inside of the hub, until that part of the casting has solidified properly. The ideal manner of solving the problem would be to treat the wheels in the same manner that chilled car wheels are treated, that is pit them immediately after they are cast to promote exceedingly slow cooling.

However, this method is not always practical in a jobbing foundry where the number of castings on an order is limited. An alternative method for one or a small number of wheels is to bare the rim as soon as possible after the wheel is cast, build a circular trough or channel in the sand on top and fill it with molten iron. This will raise the temperature of the rim and promote an even rate of cooling with the hub. The amount of iron poured in the trough will depend on the size of the wheel, the discrepancy in thickness between rim and hub, and only can be determined in any given case by experiment.

Experiences Excessive Rust On Gray Iron Castings

We are experiencing excessive rust on gray iron castings which develops immediately after shaking out. The castings in question are light in section such as registers, and legs for water heaters. After sandblasting or milling this rust again appears after a few hours have elapsed. This problem is puzzling because only part of the floor is affected that way and the remainder comes out clean. That is true of all the floors on which the castings are made. Also, the rust does not appear anywhere on castings with a heavier section of metal. The rusting shows up as various sized blotches on various parts of the casting.

Cases of severe rusting such as you mention are rare, but every so often reports are received of such occurrences. Apparently the trouble arises and disappears of its own accord without any indication of its possible cause or cure. However, it is our belief that in your particular case, the trouble is attributable to two reasons, one applying to those castings rusting on the floor, and the other to those rusting after sandblasting.

In the case of the rusted castings on the floor, we believe that the cause of rusting lies in the practice of wetting down the molds previous to shaking out, or rather to carelessness in that procedure. In other words, the man with the hose, in wetting down the molds, has a tendency to let the stream of water flow too long in one place, soaking the molds to the point where the

heat of the castings is not sufficient to prevent the moisture reaching them or to dry out such moisture. The castings are light, and consequently they do not retain as much heat as castings of heavier section which you mention are not affected.

In the case of the castings which rust after sandblasting, we believe that the air used for blowing the abrasive material, contains extra moisture, and it is advisable to see that the water separators are not filled up with water. If you do not have a water or moisture separator on the line, it is advisable to install one to remove any excess moisture in the air and prevent rusting and other troubles.

Using Rosin as Core Binder In a Steel Foundry

What information of a general or specific nature can you give us on the use of rosin or resinous compounds as a core binder in light and medium weight steel castings?

So far as results are concerned rosin is a satisfactory core binder, and at one time was used quite extensively particularly in nonferrous and malleable iron foundries where light, thin castings presented a contraction problem. The rosin softens under the influence of heat and as a result the core yields to the contracting pressure of the surrounding metal.

In recent years the manufacture of proprietary core oils and other core binders has been carried to a high degree of perfection. Also an extensive knowledge of core sands has become wide spread among foundrymen and as a result empirical mixtures have given way to mixtures based on exact data. For example instead of changing sands and binders, variation in the strength of several cores made from the same sand may be secured by varying the amount of the binder.

So much for generalities. Specifically, a certain amount of rosin is incorporated in nearly all core oil mixtures. Recently a prominent core oil manufacturer has developed a core oil for special purposes containing considerably more than the usual amount of rosin.

Feeding Required To Secure A Solid Casting

We are making a white iron ball 13½ inches diameter with a 7-inch diameter core in the center. Vent from the core escapes through a 1½-inch piece of straight core which rests in a print in the cope. The flask is 20 x 22 inches which does not leave room for a bottom gate. The feeding riser is set off center on a slant due to the core print. We are not in a position to roll the mold as suggested in the book *Gates and Risers for Castings*. We shall appreciate your suggestion on an alternative method for gating the mold to secure a round, solid casting.

To produce a casting of this shape and size, especially in white iron, the casting must be fed with hot iron through a large riser on the top. By nicking the neck of the riser it can be knocked off with a hammer, and leave only a minimum stump to be chipped or ground down to conform to the remaining contour of the ball. Style or size of gate is not a factor of importance. The metal may be introduced to the mold through any convenient type of gate.

The simplest is a straight sprue 1½-inch diameter set at a slant to the cope half of the pattern. After the mold is filled with iron a splash of water will freeze the iron in the top of the sprue. The riser then may be filled to the top with hot iron from the ladle.

The riser is fed with a rod in the usual manner and additional hot iron is introduced from time to time until the riser solidifies. Minimum suggested size of riser is 3 inches diameter at neck, 6 inches diameter above and 6 inches high. Preferably the core should be fastened at the bottom instead of at the top to facilitate feeding the casting. Alternatively, if the customer has no objection to two openings instead of one in the casting the core could be held securely in place by a piece of 1-inch heavy steel pipe.

Malleable Cast Iron Has Good Machining Properties

On many railroad malleable castings the specifications stipulate elongation of 18 per cent. Please advise us if such malleable castings would have good machinability such, for instance, as is required by automobile manufacturers for their high production work. The carbon content, we understand, largely governs the elongation, and some say governs the machinability. Would you please tell us the approximate carbon range which can be expected to result in good machinability?

You evidently understand that there is a difference of opinion as to the machinability of the so-called railroad grade of malleable. All completely annealed malleable machines readily as compared with other useful ferrous alloys. The dispute concerns itself mainly with how important a difference exists between the machinability of the two grades of malleable now described in the current standard specifications. Most of the castings used by the large automotive companies are probably above 2.4 per cent in carbon and considerable of such material is well above 2.50 per cent. This may be regarded as evidence of the preference of the automobile trade.

However, there are producers of low carbon malleable, say 2 to 2.20 per cent, who sell a portion of their products for uses where machinability is important. It is also true that some buyers of the higher carbon irons have been interested in the desire for short annealing in quite low carbon, high silicon irons. Lacking any adequate study of machinability under shop conditions, it is conservative to say that the bulk of commercial practice favors moderate carbons at least where machinability is of prime importance. It must be remembered that decarburization or pearlitic rims may so far affect machinability as to entirely outweigh minor variations in total carbon.

Wants Mixture For Refrigeration

Will you give us some information on a good gray iron mixture for refrigeration work? The mixture is to be used on castings running from five pounds to 300 or 400 pounds each, and not only must stand pressure, but also must resist the corrosive action of the refrigerants. Also will the melting procedure on any mixture you recommend be different from that used for regular gray iron castings? Any information regarding the molding methods, especially as to gates and risers together with the proper pouring procedure will be appreciated.

A suitable reply to your question relative to refrigerator castings is rather difficult due to the fact that certain specific information is not available. While you mentioned the castings will weigh from 5 to 400 pounds nothing is said about the section thickness of the castings or their design. Therefore, the answer naturally will have to be somewhat general, suggesting some compositions which you can adapt to your requirements.

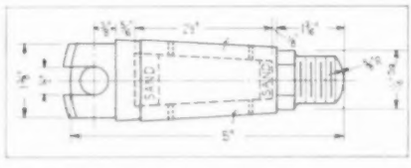
In sections from ¼ to ½ inch a mixture which will result in the following composition should be suitable: Total carbon, 3.20 to 3.40 per cent; manganese, 0.55 to 0.75 per cent; phosphorus, 0.30 per cent; silicon, 1.60 to 1.80 per cent and nickel, 1.25 per cent. With sections from ½ to 1 inch in thickness, the composition may range from 2.90 to 3.10 per cent total carbon; 0.75 to 0.95 per cent manganese; phosphorus 0.20 per cent; silicon 1.10 to 1.30 per cent; and nickel, 1.75 per cent. With sections from 1 to 2 inches in thickness the total carbon may be 2.80 to 3.00 per cent; 0.75 to 0.95 per cent manganese; 0.20 per cent phosphorus; 0.90 to 1.10 per cent silicon; 1.75 per cent nickel; and 0.25 to 0.35 per cent chromium.

As far as melting procedure is concerned, there is no reason to make any changes from your present practice provided you now are obtaining good hot iron. If that is not the case, you will have to make the necessary adjustments to secure hot iron. Additions of nickel may be made in the cupola or at the spout. In the case of chromium, if ground ferrochromium is used, additions will have to be made at the spout or in the ladle, but if ferrochromium briquets are used, they may be added to the metal charge in the cupola. Nickel-chromium bearing pig iron also may be used.

Molding methods will depend upon the pattern equipment, and the number of castings desired. Location of gates and risers should be such as to insure good, solid castings, and that phase will have to be left to the judgment of one who has the necessary experience. Pouring procedure for refrigerator castings does not differ from that employed for other types of castings. The metal should be poured as hot as possible, and will depend upon the section thickness; that is to say thin section castings will have to be poured with hotter metal than those with a heavy section. As in the case of any casting, the pouring speed should be such that the sprue is filled quickly, and that condition maintained until the mold cavity is filled.

Reduce the Amount Of Core Binder

We are making a plug for a valve and have difficulty in removing the core. The main part of the core is too hard to rattle out in the tumbling barrel, while the ends, as marked on the blueprint do not clean out. We shall appreciate your suggestion for a proper core sand mixture.



Core is hard to clean from shaded areas

From the evidence submitted we are inclined to the opinion that your sand is too heavily bonded either with an artificial binder or with molding sand, perhaps both. Cut down on one or both of these. Dry the cores thoroughly and they should rattle out of the castings readily. A suitable sand mixture can be made up from an almost endless number of combinations, in fact with the ample supporting prints, the core might be made in green sand. However, if you are committed to dry sand cores made in the usual manner in a split box, cut down the binder and the molding sand to a minimum amount, ram the cores gently and dry them thoroughly. An excess amount of artificial binder makes the cores hard, and addition of molding sand reduces the refractoriness. In the first instance the cores do not disintegrate readily. In the second instance the surface of the core fuses and sticks to the casting. Blacking the ends of the cores will prevent the sand from fusing and will leave a smooth surface on the inside of the casting.

A few experiments should produce a suitable core mixture.

Use Alloy Steel in Billet Rolls

We have some steel rolls to make 12 inches and 22 inches diameter for a billet mill. We have been advised to use nickel and chromium in these castings. We shall appreciate your advice on the proper analysis of the metal and on the subsequent heat treatment. Enclosed sketch shows proposed method of molding and gating.

Before the advent of alloy steels, fairly satisfactory steel rolls were made from plain carbon steel containing from 0.35 to 0.40 per cent carbon, 0.75 to 0.80 per cent manganese, 0.30 per cent silicon, with sulphur and phosphorus under the usual maximum 0.05 per cent. These castings received a plain normalizing treatment, heated to 1650 degrees Fahr., held for ½ to 1 hour per inch of diameter and then cooled slowly. However, physical properties and life of the rolls have been increased in recent years by the addition of various alloying elements.

In many instances the composition and subsequent heat treatment have been patented. You may find it advisable to familiarize yourself with this feature which lies outside the range of the present discussion. The following compositions are suggested for the rolls you propose making: 1—Carbon 0.40 per cent, chromium 0.75 per cent, nickel 1.50 per cent, manganese 0.75 per cent, silicon 0.40 per cent, sulphur and phosphorus 0.05 per cent. Heat treatment for these castings includes full annealing at 1700 degrees Fahr. (1 hour per inch diameter) air cooled from 1650 degrees Fahr., then drawn at 1250 degrees Fahr. 2—Carbon 0.35 per cent, manganese 0.70 per cent, silicon 0.30 per cent, molybdenum 0.35 per cent, sulphur and phosphorus under 0.05 per cent. These castings are full annealed, normalized and drawn.

In the sketch which accompanied the inquiry you showed the mold in a round flask, closer to one side than the other on account of the sprue. The thickness of sand is not indicated, but your attention is directed to the fact that the variation in thickness may cause the roll to warp on account of one side cooling before the other. Also your proposed method of introducing the metal through a fountain jet under the bottom wabbler is open to criticism. The universal method of gating rolls, either iron or steel is to run the gate at a tangent to the bottom neck, about half way between the wabbler and the shoulder. With this method of gating, the metal whirls as it rises in the mold and thus holds any foreign material in the center of the casting.

Oxidation Is Cause Of Inverse Chill

We are enclosing three samples broken from sanitary ware castings showing a white or chilled area in the center surrounded by gray iron. We shall appreciate your opinion on the cause of this phenomenon.

So far as we know the only theory covering this erratic form of defect which comes and goes without warning or without any apparent change in operating conditions, is that presented by the late Dr. Moldenke in *Principles of Iron Founding*. The excerpt follows: "We have here the strong probability of melting done at the critical point of the fuel bed—either as the result of drastic lowering by melting a double charge of iron as the first charge, or the successive dropping of the bed at the end of melting each charge before restoration by the intermediate coke charge. Chemically speaking there was free oxygen present at the melting of the last of each charge of iron, with consequent oxidation. To speculate on how this situation may result in the phenomenon in question the following facts must be borne in mind.

"When the mold is filled with molten iron a shell promptly is formed, leaving some liquid iron within for a time. As the gate freeezes and thus cuts off feeding there is a natural tendency to produce a shrink spot below it if the iron either has been slightly oxidized, or with good iron if the gating arrangement is poor. In the case of very badly oxidized iron, another set of conditions intervenes as the occluded gases and dissolved iron oxide tending to make them, may be sufficient to not only prevent any shrinking tendency on the part of the iron, but to actually cause it to try to expand. (This is entirely apart from the regular *contraction* of iron on cooling from *set* metal to ordinary temperature, erroneously called *shrinkage*).

A practical demonstration of this contention may be seen in foundries having trouble with their iron, on looking over the tops of the sprues of freshly poured molds. If a slight funnel shaped depression is observed, the chances are that the iron was fine. If flat, showing that no feeding has taken place, there is possible trouble—the situation is just on edge. Puffed up sprues show badly oxidized iron, of an open structure, porous metal full of gas and pin holes under the cope. With the foregoing in mind, it is quite possible to understand why any such badly oxidized iron, coming from the end of those of the cupola charges which have melted too low on the bed, may on filling the mold, form a shell of gray iron, and after the gate freezes, imprison the remaining liquid iron within. This, on trying to puff out or expand, comes under sufficient pressure to prevent graphite formation, which in turn means white iron. Only a knowledge of what oxidized molten cast iron is and will do, can explain the situation adequately,

Pipe Coil Will Not Melt in Casting

We are enclosing blue print of an iron ring casting in which a coil of 2-inch extra heavy pipe is enclosed. Our present problem is to prevent the pipe from burning through. The casting weighs 2000 pounds. Is litharge a good coating for a pipe employed in this manner. Will you kindly indicate the best manner in which to gate this casting and the best method to protect the pipe.

Litharge is as good as any other material for coating a pipe coil enclosed in a casting. However, the coating is not a protective coating to prevent the metal from burning through. It merely protects the clean surface of the pipe and prevents the molten iron from *kicking* away from it. A light coating of oil is just as good.

The coil will not burn through unless the stream of metal from the gate plays directly on some part of the pipe. For that reason the metal should be introduced at a point or points where it will not impinge directly on the coil. Since you do not state the position in which the casting is molded we cannot specify the exact position of the gates. If it is molded in the position shown on the blue print you have two alternatives. In the event that the center core is dry sand, a ring of pop gates close to the core on the top edge is to be preferred. If the pattern leaves its own green sand core, then a sprue can be run down through the center of the core to connect with two flat branch gates entering the bottom of the mold.

Top gates are better than bottom gates, because as the metal rises from the bottom it cools to some extent and has a tendency to form a protective sheath around the pipe coil. Metal entering the bottom keeps the temperature highest in that area all the time the mold is filling. Your principal problem is to anchor the coil so that it does not wriggle around when it is raised to high temperature. To a person unaccustomed to this class of castings, the manner in which a coil will wriggle around like a snake is positively astonishing.

Gray Iron Does Not Tin Well

We are meeting considerable difficulty in hot tinning gray iron castings. We do not have any trouble tinning malleable iron castings, but for some reason or other, the gray iron does not tin well, even on smooth surfaces which have been machined or ground. We have tried all kinds of schemes and combinations, using hydrofluoric, sulphuric and carrying of our flux on top of the tin pot without results.

The first operation in preparing gray iron castings for hot tinning is the removal of the foundry sand through pickling, tumbling, or sandblasting—the latter being the most preferable. However, if you wish to pickle the castings, do so in a cold solution comprised of 1 gallon of water to which are added 20 ounces of hydrofluoric acid, and 12 ounces of muriatic (hydrochloric) acid. After the sand has been removed, the castings are dipped in a muriatic (hydrochloric) acid solution containing 1 part of water and 1 part of acid. Then without rinsing, the castings are set aside to dry in an oven or on racks provided with a source of heat, and are kept heated until they are tinned. Should any rusting develop, the castings must be dipped again in the acid and redried.

In tinning, the castings are first dipped in a weak solution of muriatic (hydrochloric) acid pickle containing 1 part of acid in 20 parts of water, and then transferred to a concentrated solution of zinc in muriatic acid which contains 5 pounds of granulated sal ammoniac per gallon. From that fluxing bath, the castings are placed in the first tinning kettle, allowing them to remain a sufficient length of time to bring them up to the temperature of the bath which should range from 500 to 525 degrees Fahr. Then they are taken out, placed in the second or finishing kettle which is maintained at 400 degrees Fahr. The castings are permitted to remain in the finishing kettle until the temperature has dropped to that of the bath, and then they are removed, shaken off, and placed in a tank of kerosene oil to cool. After the castings are cool enough, they are taken out, rinsed in hot water and dried in soft wood sawdust.

The flux used on the first or roughing tin kettle is zinc chloride, which is spread over the surface of the bath to a thickness ranging from ½ to ¾-inch to which has been added some granulated sal ammoniac. Fresh flux must be added to maintain the proper thickness The flux for the second or finishing tin kettle should be the best beef tallow, and the thickness of the covering should range from ¾ to 1-inch.

MEN OF INDUSTRY

HYMAN BORNSTEIN, director, testing and research laboratories, Deere & Co., Moline, Ill., was elected president of the American Foundrymen's association at the annual business meeting of that organization on May 6. Mr. Bornstein climaxes many active years in the association, having served at various times as chairman of the committee on gray iron castings, member of the committee on specifications for malleable castings, member of the committee on liquid shrinkage investigation of metals advisory to the bureau of standards, member of the ferrous metals advisory committee to the bureau of standards, member of the committee on metallography and many others. At present he is chairman of the alloy cast iron committee of the AF.A. He also served as a director of the association from 1932 to 1935.

Mr. Bornstein was born in Chicago and attended Armour Institute of Technology from which he graduated in 1911. Four years later he graduated from the John Marshall Law school, Chicago. After serving as chemist for the Union Pacific railroad and later for Swift & Co., Chicago, he was made chemist for the city of Chicago, resigning that position to become a captain in the ordnance department at the outbreak of the World war. Following the war he became affiliated with Deere & Co. Mr. Bornstein is a member of the American Chemical society, American Institute of Mining and Metallurgical Engineers, the American Society for Testing Materials, and the American Society for Metals. He has served as chairman and director of the Quad-City chapter of the American Foundrymen's association; and as chairman of the Tri-City chapter of A.S.M. and the Tri-City council.

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MARSHALL POST, vice president, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., was elected vice president of the American Foundrymen's association at the annual business meeting held May 6. Mr. Post, who began his extended foundry career as an apprentice molder with the American Steel Foundries, Granite City, Ill., in 1900, was born in San Antonio, Texas, in 1883. After an apprenticeship of 3 years he became journeyman molder with the Commonwealth Steel Co., Granite City, remaining there for 2 years, when he again became associated with the American Steel Foundries as assistant foreman. He later was promoted to night foreman and in 1912 became foundry superintendent. He joined the Marion Steam Shovel Co., Marion, O., in 1918, serving as superintendent of foundries, but returned to the American Steel Foundries in 1920 as works manager of the Sharon, Pa., plant. From 1923 to 1925 he acted as works manager of the Thurlow plant, Chester, Pa. Since 1925 Mr. Post has been vice president and works manager of the Birdsboro Steel Foundry & Machine Co., the position he now occupies. Mr. Post also is a member of the Steel Founders' Society of America.

♦ ♦ ♦

THERNY W. HANCOCK recently has been appointed assistant foundry foreman of Apex Steel Co. Ltd., Los Angeles. He served as foreman at the Reed Prentiss Co., Worcester, Mass., from 1914 to 1916. Mr. Hancock was affiliated with the Rodney Hunt Co., Orange, Mass., from 1916 to 1926, serving part of the time as foreman. From the latter year to 1932 he was connected with the insurance and brokerage business. Mr. Hancock served as assistant foreman of the J. W. Penney Co., Mechanic Falls, Me., from 1934-36 and prior to his present position he was with the Portland Co., Portland, Me.

♦ ♦ ♦

J. B. SHELBY has been advanced to the management of the foundry division, Driver-Harris Co., Harrison, N. J. He will act as co-manager with J. SAMMON. H. O. HARTDEGEN, sales engineer, will take charge of the territory comprised of northern New York and eastern Pennsylvania and will handle some accounts in the New Jersey territory, formerly assigned to Mr. Shelby.

♦ ♦ ♦

GEORGE MAILY has become associated with Sack Inc., Cambridge, Mass., manufacturer of distinctive furniture trimmings, as foundry organizer and superintendent. Previously, Mr. Maily was connected with the Keeler Brass Co., Grand Rapids, Mich., for 2 years and with the Gorham Mfg. Co., Providence, R. I., for 3 years.

♦ ♦ ♦

CAL SIVRIGHT has been elected president of the Oliver Farm Equipment Co., Chicago, succeeding C. R. MESSINGER, chairman of the board. A. KING MCCORD, recently assistant to the president, and J. M. TUCKER, general sales manager, have been elected vice presidents.

♦ ♦ ♦

LLOYD W. RICHMOND recently was made foundry superintendent, Des Moines Stove Repair Co., Des Moines, Iowa. Mr. Richmond started his foundry career at the age of 15 when in 1913 he was made an apprentice at the Des Moines Stove Repair Co., working under Wilhelm Christiansen. He is a graduate of McLain's System Inc., Milwaukee.

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S. M. D. CLAPPER, formerly president, General Refractories Co., Philadelphia, recently was elected chairman of the board, and FLOYD L. GREEN, formerly executive vice president was made president.

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RALPH S. MACPHERRAN, chief chemist, Allis-Chalmers Mfg. Co., Milwaukee, sailed May 8 on the S. S. REX for a European trip. Mr. MacPherran will visit in Italy, Switzerland, Germany and England. He will sail for home on June 20.

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W. B. COULLIE, general sales manager of the Harbison-Walker Refractories Co., Pittsburgh, was elected a director of the company at a meeting held April 19.

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GEORGE MCCONAHAY, American Steel Foundries, Alliance, O., recently was elected secretary of the Association of Safety in Ohio at the Ohio Safety congress in Columbus, O.

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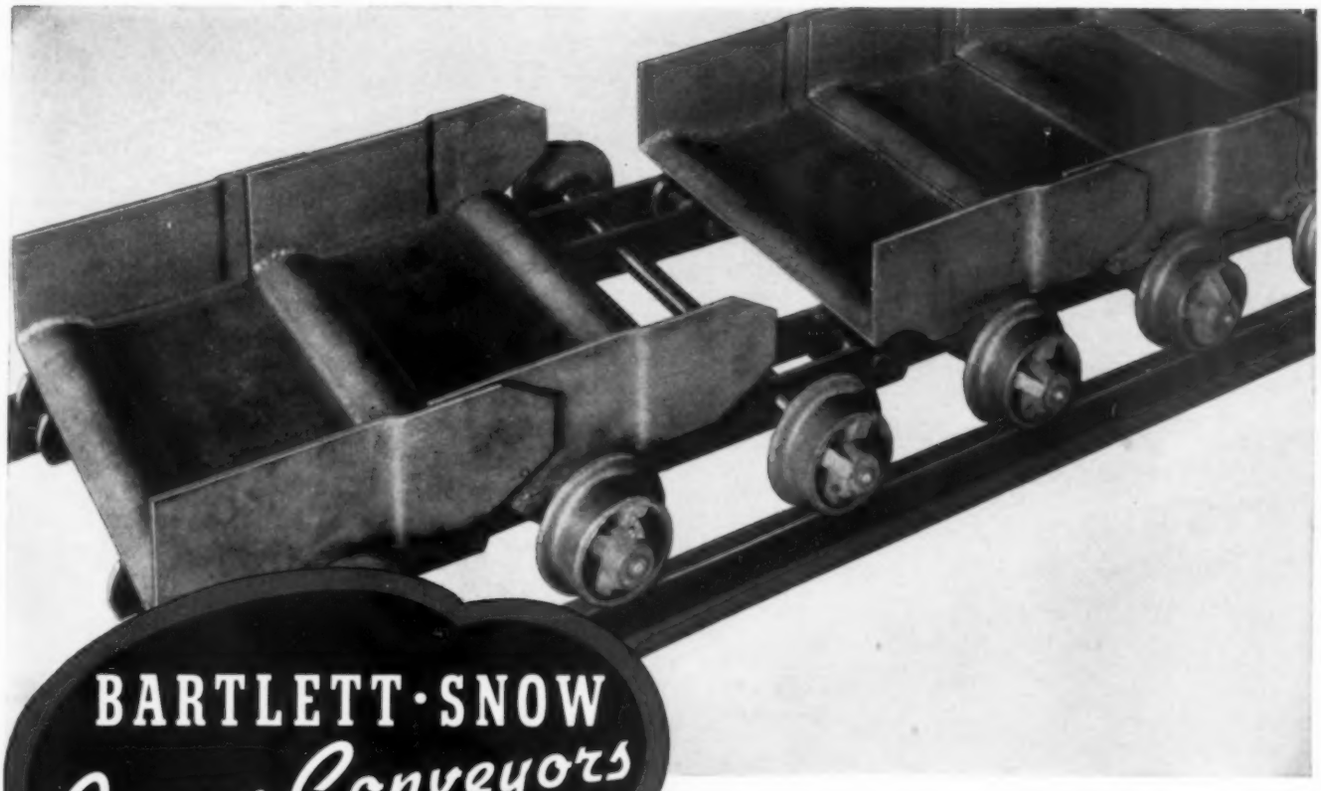
FRED C. KINDLER, formerly with the Otis Steel Co., Cleveland, has been appointed manager of steel castings sales of the Mackintosh-Hemphill Co., Pittsburgh. He had been connected with the Otis com-

(*Concluded on page* 50)

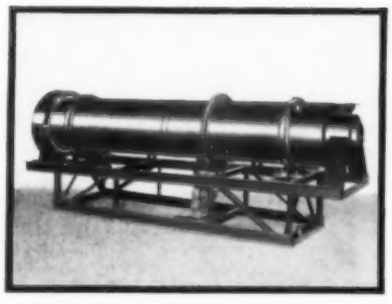


BARTLETT·SNOW *Apron Conveyors* COMPLY WITH THE PRINCIPLE . . .

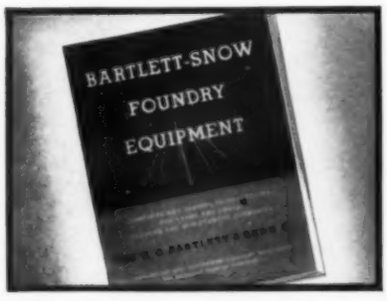
. . . that a straight line is the shortest distance between two points. They carry long stretches—straight as a die—without wind or weave . . . incur a minimum of wear . . . and a much reduced power requirement.

Each pan with its stiffening beads and leak proof ends transmits the entire weight of its load to its own axle and wheels . . . and can be removed from the assembly without disturbing even the adjacent pans. The chains are used only to join the pans, and pull them along together. They experience none of the load, thrust, or other forces that cause breakage, transverse sway, and excessive wear in conveyors of less exacting design.

Bartlett-Snow Apron Conveyors are but one of the equipments designed and built by Bartlett-Snow specially for foundry service. They reflect the efficiency of a construction based on 25 years' first hand experience in solving the problems encountered in actual rather than theoretical operation . . . and suggest the obvious advantages of referring your foundry problems to the Bartlett-Snow foundry engineers. What are your problems?



BARTLETT-SNOW DIRECT HEAT DRYER . . . coal, gas or oil fired and portable, if desired, for drying new stocks of core or molding sand.



BULLETIN No. 75. Complete with 120 illustrations and 26 engineering diagrams, this 44-page booklet describes the Bartlett-Snow method of securing less costly; more efficient operation. Send for one!

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SAND HANDLING AND SAND CONDITIONING EQUIPMENT
MOLD CONVEYORS AND ACCESSORY FOUNDRY EQUIPMENT

(*Concluded from page* 48)

pany for 26 years. GEORGE F. WALKER, connected with sales development at the H. H. Robertson Co., Pittsburgh, for approximately 20 years, has joined the sales staff of the Mackintosh company. He will be working chiefly in the steel casting division.

♦ ♦ ♦

F. J. WURSCHER, formerly metallurgist, Gale Mfg. Co., Albion, Mich., recently has become connected with Stanley G. Flagg & Co., Philadelphia, as superintendent of its four foundries located at Stowe, Pa. Mr. Wurscher was born in Vienna, Aus-

F. J. Wurscher

tria, and received his education in the schools of that city. He graduated from the University of Vienna in 1920 with a degree in chemical and metallurgical engineering. During the World war Mr. Wurscher served 4 years as a commissioned officer in the Austrian army. Upon immigrating to this country in 1922, he took the position of chief chemist, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., and in 1926 was made assistant metallurgist. In 1928 he was transferred to the Pontiac Motor Car Co. in the capacity of metallurgist of the gray iron foundry. Mr. Wurscher remained in that position until 1931 and upon suspension of foundry operations, joined that company's staff in the experimental laboratories. In 1935 he became connected with the Gale Mfg. Co., Albion, Mich., as metallurgist and since March, 1937, he has been associated with Stanley G. Flagg & Co.

♦ ♦ ♦

W. B. DEXTER has been appointed general manager of the National Iron Works, San Diego, Calif. He will supervise a program of modernization and expansion.

♦ ♦ ♦

CHARLES RUTLEDGE has been appointed service representative in the Detroit district for the American Foundry Equipment Co., Mishawaka, Ind. His headquarters will be with Hutton H. Haley & Associates, 2918 East Grand boulevard, Detroit.

♦ ♦ ♦

J. C. JOUBLANC has been appointed chief metallurgist for the Harnischfeger Corp., Milwaukee. For 10 years he was connected with the Republic Steel Corp. and for 4 years with the welding development and research department of a welding equipment manufacturer.

♦ ♦ ♦

C. H. KISSEL, Goulds Pumps Inc., Seneca Falls, N. Y., was appointed second vice president of the Purchasing Agents Association of Syracuse and Central New York, at its recent meeting. R. W. APPLETON, Morse Chain Co., Ithaca, N. Y., was elected a national director. GEORGE STANTON, Syracuse Foundry Co., Syracuse, N. Y., was elected a director to serve for 2 years.

♦ ♦ ♦

GLENN M. RUMSEY recently was appointed district manager for New York state, with the exception of New York, for the Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y. Mr. Rumsey was formerly in Chicago and Philadelphia for that company. His headquarters will be at Montour Falls.

♦ ♦ ♦

A. D. MCDONALD, associated with Lebanon Steel Foundry Co., Lebanon, Pa., for many years as eastern district sales manager of the Philadelphia office, has been elected vice president in charge of sales. K. V. WHEELER has been elected vice president and plant manager and FRED GROTTS has been named vice president and metallurgical director.

♦ ♦ ♦

H. B. HANLEY, formerly foundry superintendent of the American Laundry Machinery Co., Rochester, N. Y., has been appointed to the position of foundry manager and chief metallurgist for that corporation. At the recent meeting of the American Foundrymen's association in Milwaukee, Mr. Hanley was elected a member of the board of directors for a 3-year term.

♦ ♦ ♦

HON. MICHAEL DWYER, minister of mines for Nova Scotia, was elected president of the Canadian Institute of Mining and Metallurgy at the 38th annual meeting of the association held in Montreal in March. Mr. Dwyer attained national prominence a year ago in connection with the rescue work at the Moose River gold mine in Nova Scotia. The newly elected president is a brother of Pat Dwyer widely known engineering editor of THE FOUNDRY.

♦ ♦ ♦

ROBERT GREGG, general foundry superintendent, Reliance Regulator Corp., Alhambra, Calif., has been elected temporary chairman of the recently organized Los Angeles Chapter of the American Foundrymen's association. He emigrated to this country in 1907 at the age of 19 and worked as a journeyman in Montreal, Chicago and Pitts-

Robert Gregg

burgh. Mr. Gregg was foundry foreman from 1911 to 1912 of the Phoenix Engine Works, Tacoma, Wash. For the following 2 years he was foreman of the British Columbia Brass Works. Through 1915 and 1916 Mr. Gregg acted as foreman of the Steiger & Kerr Foundry, San Francisco, going from that company in the latter year to become foundry superintendent for 4 years of the Hesse-Martin Iron Works, Portland, Oreg. In 1920 he became foundry superintendent of the Keystone Steel Works, Los Angeles, and from 1923 to 1927 acted as consulting foundry engineer of the Industrial association, San Francisco. Since 1927 Mr. Gregg has been affiliated with the Reliance company.

♦ ♦ ♦

L. J. REAY has been appointed president of the Diamond Iron Works, Minneapolis, and its subsidiary company, Mahr Mfg. Co. Mr. Reay was born in Maine and went to Minneapolis from Parkersburg, W. Va., where for 8 years he was treasurer of the Ames-Baldwin-Wyoming Co. Prior to that time he was associated with Stone & Webster Inc., in Boston and Seattle. G. A. BINGENHEIMER, formerly president, has been made chairman of the board of the company.

IT'S 6 *New and Exclusive Features* DREW CROWDS AT THE MILWAUKEE SHOW

● Newly introduced at the Milwaukee Show the Johnston & Jennings No. 260 Jolt Squeeze machine pictured herewith features the many cumulative improvements developed by Johnston & Jennings engineers *and, in addition, 6 new features* conceived and perfected by Johnston & Jennings engineers and now made available *for the first time* in *any* machine of *any* manufacture. Each is a definite and positive customer advantage that will speed up your output . . . and permit the use of this machine with greater efficiency over a wider range of flask sizes. Let us send you more complete details of these latest Johnston & Jennings contributions to more efficient—and that means more profitable—foundry operation. What are your moulding machine requirements?

ONLY THE JOHNSTON & JENNINGS NO. 260 JOLT SQUEEZE CAN GIVE YOU

1 **AN ADJUSTABLE SQUEEZE HEAD** that permits the pressure plate to be set at *any* desired distance above the top plate by simply changing the setting of two lock nuts . . . thereby facilitating the rapid changing of the machine from one height flask to another, *by the moulder* . . . and conserving time and air.

2 **PERFECTLY BALANCED SQUEEZE HEAD**—spring controlled, and adjustable—to balance the squeeze head in the moulder's most convenient position . . . eliminating stretching and long reaching.

3 **SPECIALLY DESIGNED RACK** to support match plates and patterns . . . and rubber guarded to protect them against injury.

4 **MECHANICAL SQUEEZE HEAD LOCK** which latches automatically to hold the pressure plate in an upright position producing an even squeeze *at all times* . . . yet unlatches instantly as the squeeze head is pushed back.

5 **CLOSING BENCH AND RIDDLE RACK** newly redesigned and conveniently located . . . and furnished as standard equipment.

6 **IMPROVED CUT-OFF VALVE** for jolting—reducing air consumption to a minimum.

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E. A. BLAKE
Sales Engineer

1937

H. B. Hanley | Thomas Kaveny | C. J. P. Hoehn | C. E. Sims | Duncan P. Forbes

A. F. A. Elects Directors

ELECTION of six board members of the American Foundrymen's association was announced at the annual business meeting of that organization in Milwaukee on May 6. The directors chosen are as follows: Duncan P. Forbes, H. B. Hanley, C. J. P. Hoehn, Thomas Kaveny, Clarence E. Sims and James L. Wick Jr.

Duncan P. Forbes

DUNCAN P. FORBES, whose ancestors were pioneers in malleable iron production in America, and whose great-grandfather established the company which Mr. Forbes now heads, was born in Rockford, Ill. After graduation from Yale university, New Haven, Conn., in 1919 he took post graduate work at that institution, specializing in metallurgy, and later spent some time in the laboratory of Prof. Enrique Touceda studying the metallurgy of malleable iron. He entered the employ of the Rockford Malleable Iron Works, Rockford, Ill., in 1921 as a molder and in a short time was appointed junior metallurgist. Later, he was appointed molding foreman and in 1925 was made works manager. In 1928, upon the organization of the Gunite Corp., Mr. Forbes was made president. Later he was elected to the presidency of the Rockford-Northwestern Malleable Corp. which, in 1932 became known as the Gunite Foundries Corp. He now is president and general manager of that organization. Mr. Forbes was at one time a director of the Malleable Founders' society, and is an active member of the A.F.A., the American Society for Metals and the Society for Automotive Engineers.

H. B. Hanley

H B. HANLEY, whose foundry career has been a long and active one, was born Feb. 25, 1887 in North Attleboro, Mass. and attended the public schools of Providence, R. I., augmenting his education with special work at Brown university and Massachusetts Institute of Technology. Mr. Hanley began his industrial career with Saunders & Franklin, Providence, gaining experience in analytical chemistry, metallurgy and sand research. Following 9 years with that company he became connected in various capacities with the New London Ship & Engine Co., Groton, Conn.; the Holland Submarine Torpedo Boat Co.; the General Ordnance Co., and the General Alloys Equipment Co. During that period Mr. Hanley helped build and operate the first foundry plant in the United States for the exclusive manufacture of submarine diesel engines and installed and operated the first electric furnace in the New England district for the manufacture of iron and steel castings to United States navy specifications. In 1922 he became associated with Whitehead Bros. Co., New York, as manager of its testing department and consultant on foundry sand practice. For a number of years he actively promoted sand control in foundries by writing numerous papers on the subject and speaking before many foundry groups. In 1923 he contributed the annual A. F. A. exchange paper to the International Foundry congress in Paris on the subject of sand. He joined the American Laundry Machinery Co., Rochester, N. Y. in 1929, where he recently has been made foundry manager and chief metallurgist.

C. J. P. Hoehn

C J. P. HOEHN was born in San Francisco and attended school there. He began his career in the foundry industry in 1890 as an apprentice molder with the Enterprise Foundry Co., of which he now is president. A member of the American Foundrymen's association since 1924, he has been active on the West coast for many years in the interests of that organization and now is vice chairman of the Northern California Chapter of the A.F.A. He is a member of the San Francisco Engineers club and is a past president of both the Pacific Coast Founders' association and the Manufacturers' Association of South San Francisco. For many years he has represented the association on the committee on manhole frames and covers, Project A-35 under the procedure of the American Standards association.

Thomas Kaveny

THOMAS KAVENY, for 21 years a member of the American Foundrymens' association, was born in Canaudaigua, N. Y., and received his early education there. Later he attended Canaudaigua Academy and Cornell university, Ithaca, N. Y., graduating from the latter with a degree in engineering. For 17 years

(*Concluded on page* 57)

ADVERTISING PAGES REMOVED

(*Concluded from page* 54)

Mr. Kaveny was sales manager of the N. K. Fairbank Co., Chicago, resigning that position to become affiliated with the Herman Pneumatic Machine Co., Pittsburgh, where he has been president for the past 23 years. Mr. Kaveny is well known among foundrymen of this country, having traveled extensively visiting foundrymen in every section.

Clarence E. Sims

CLARENCE E. SIMS, supervising metallurgist, Battelle Memorial institute, is the author of numerous technical papers. He was born in Chicago where he received his early education, later attending the University of Illinois from which he graduated with a bachelor of science degree in chemical engineering. He continued his studies at the University of Utah where he received his master of science degree. He then entered industry and servd in various capacities with the Anaconda Copper Mining Co., Anaconda and Great Falls, Mont.; Michigan Electrochemical Co., Menominee, Mich.; R. W. Hunt Co., Chicago; research division, Chemical Warfare service, Washington; Aluminum Co. of America, Niagara Falls; the U. S. bureau of mines experiment station, Seattle, Wash., and the American Steel Foundries, East Chicago, Ind. Mr. Sims recently was appointed supervisory metallurgist, Battelle Memorial institute, Columbus, O. With G. A. Lilliequist he was awarded the Robert W. Hunt prize by the American Institute of Mining and Metallurgical Engineers in 1933 for the paper "Inclusions, Their Effect, Solubility and Control in Cast Steel."

James L. Wick Jr.

JAMES L. WICK JR., retiring president of the American Foundrymen's association and president and general manager, Falcon Bronze Co., Youngstown, O., since 1929, was born in Youngstown in 1883, and attended the schools of that city. He received his higher education at Massachusetts Institute of Technology, graduating with a bachelor of science degree in mechanical engineering. Following graduation, he served as assistant to the general master mechanic, Youngstown Sheet & Tube Co. in 1906 and 1907 and the next two years as assistant to the chief engineer. He resigned that position to become general manager, secretary-treasurer, Crystal Ice & Storage Co., Youngstown, and was associated with that company until 1918. Mr. Wick then returned to the Youngstown Sheet & Tube Co. and the following year accepted a position as secretary and assistant general manager of the Falcon Bronze Co. He became vice president and general manager of that company in 1925 and since 1929 has maintained his present position. Mr. Wick has had a long career of distinguished service to the foundry industry and the affairs of the A.F.A. For many years he has been active in the cost work of the association and has taken a leading part in the affairs of the nonferrous division. Prior to his election as a director, Mr. Wick served as chairman of the divisional activities correlation committee, vice president of the association, and during the past year as president.

Gray Iron Society To Meet

Annual convention of the Gray Iron Founders' society will be held in Cleveland June 11 and 12 at the Cleveland hotel. All gray iron foundry executives in the country have been invited to participate and acceptances indicate the largest gathering in the history of the industry.

Whiting Williams will speak on industrial relations and L. J. Wischerath, foundry advertising expert, will present a talk on publicity. Other national speakers will be included in the program and important matters concerning the industry will be discussed. Great Lakes Exposition, opening in Cleveland May 29, has announced June 12 as Gray Iron Founders' day, with special arrangements for the convenience of the foundrymen attending.

Papers To Interest Iron Founders

The fortieth annual meeting of the American Society for Testing Materials will be held at the Waldorf-Astoria, New York, from June 28 to July 2. During the meeting a large number of papers and reports will be presented for discussion. Several symposiums have been arranged, and of these, one on "Significance of Tests of Coal and Coke" should be of interest to foundrymen. At least four papers to be presented at the meeting will relate to cast iron discussing such phases as tensile strength, correlation of physical properties with section thickness, effect of length of span on transverse test results, and graphite flake size.

Clyde Iron Works Co., Duluth, manufacturer of hoists, hoisting engines and derricks, has appointed Hall-Perry Machinery Co., Butte, Mont., as its distributor for Montana, with the exception of one county near the Wyoming line.

French Association Elects Officers

Officers elected for the year 1937-38 at the annual general meeting of the Association Technique de Fonderie, held at the end of March include the following:

President: Achille Brizon, managing director, Fonderies A. Brizon. Senior vice president: Henri Sandre, president and managing director, Societe Metallurgique du Perigord. Vice presidents: Pierre Chevenard, professor, Ecole Superieure de Fonderie; Eugene Dady, president, Association Amicale et Mutuelle de Fonderie; Jean Derdinger, honorary president, Chambre Syndicale des Fondeurs en Cuivre et Bronze de France; Charles Koehler, chairman, Societe Anonyme des Fonderies de Saint-Ouen; Jean Lobstein, managing director, Usines Lobstein; Leon Montupet, managing director, Fonderies Montupet; and Henri Strube, president, Chambre Syndicate des Fondeurs en Cuivre et Bronze de France.

Honorary foreign vice presidents: Leon Brasseur, for the Grand Duchy of Luxemburg; J. M. Espana, managing director, Alie Ltd., for Spain; Federico Jarach, vice president, National Fascist Federation of Mechanical and Metallurgical Industries, for Italy; Joseph Leonard, president, Association Technique de Fonderie de Belgique.

General secretary: Roger R. Meyer, director, Societe de Produits Metallurgiques. Treasurer: Daniel Waeles.

The new president, Achille Brizon, graduated as a metallurgical engineer from the Ecole Centrale des Arts et Manufactures, Paris, in 1913. After having seen active service throughout the war as an officer in the French artillery, Mr. Brizon started his career in industry and at one time was manager of the foundry of the pioneer firm of French automobile manufacturers, Etablissements de Dion-Douton. He then took a prominent part in the foundation of Fonderies A. Brizon, of which firm he is now managing director. Mr. Brizon, as vice president of the French foundry association, was head of the French delegation which attended the International Foundry congress in Philadelphia in 1934.

Occupational accident deaths in 1936 according to the National Safety council, were but half as numerous as in 1913 when organized safety work began and reductions in accident frequency and severity rates since 1913 had saved about 265,000 lives and effected a further saving of $3,700,000 to employers, workers, their dependents and the public.

WHY SCRAP COSTS MORE THAN AJAX INGOTS

Suppose you bought the heap of scrap here in the picture—how would you *know just what* is in every part of the heap?

If you bought an equal weight of AJAX PROCESS INGOTS you would *know just what* is in every one, because we would *guarantee* the analysis.

And the two results, if you used first the scrap and then the ingots for castings, would be these:

Scrap—its first cost is *possibly* a little lower; its composition always doubtful unless you make constant analyses; impurities—which are nearly always present—are expensive to remove; and besides you have to pay for them; the uncertain composition reduces the possible number of perfect castings; *all of which makes scrap an expensive and uncertain medium.*

AJAX INGOTS—The first cost *may* be a trifle higher, but not necessarily; metallurgical uniformity is absolutely guaranteed; the impurities are so low that they are really negligible; *all* the metal is useful; they produce more castings; and every casting is like every other.

Our metallurgists will gladly confer with you regarding our standard formulae, or other formulae to meet special conditions. Get in touch with us now.

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AJAX-WYATT MELTING UNIT

DURING 1936

AN INCREASE OF 2470 K.W. IN U.S.A.

1937

Every Progressive Melter is Giving Consideration to Improved Methods of Melting.

THE AJAX-WYATT FURNACE IS RAPIDLY INCREASING IN POPULARITY.

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PHILADELPHIA

Ajax Electrothermic Corporation Ajax-Northrup induction furnaces for melting and localized heating and hardening.	ASSOCIATE COMPANIES The Ajax Metal Company Non-ferrous ingot metal for foundry use.	Ajax Electric Co. Inc. Ajax-Hultgren Salt Bath Furnace and Resistance Type electric furnaces for all heat treating operations.

VIEWING FOUNDRY DEVELOPMENTS AT SHORT RANGE

STRAINER cores in the gating of various types of nonferrous castings have given excellent results according to those who have tried them. They are particularly applicable to aluminum bronze and manganese bronze alloys which must be poured without turbulence.

• • •

A cast chrome-manganese-molybdenum steel containing 0.30 *to* 0.35 *per cent carbon;* 0.90 *to* 1.25 *per cent manganese;* 0.90 *to* 1.10 *per cent chromium, and* 0.30 *to* 0.40 *per cent molybdenum is said to give excellent results for cast gears ranging in weight from* 800 *pounds down, and employed for a wide variety of purposes.*

• • •

Paints which change color with an increase of temperature now are available commercially. They include 5 grades which change color permanently, and 8 grades which return to their original colors when normal conditions are restored. The first cover a range of temperature between 284 degrees Fahr. and 734 degrees Fahr. while the second cover a range from 184 degrees Fahr. to 464 degrees Fahr.

• • •

A STEEL foundry making a large order of heavy bridge cable clamps found that removing the stubs left by riser necks was a time-consuming, costly operation, and sought to reduce both of those elements to the minimum. The castings were 6 feet long, 4 feet outside diameter, semicircular in cross section with an 18-inch concave radius, and each contained eleven 10 to 12-inch riser neck stubs. Washing-off the stubs was tried on two of the castings, and the work was completed in two hours actual gouging time, consuming 800 cubic feet of oxygen and 85 cubic feet of acetylene, or 400 cubic feet of oxygen and 42½ cubic feet of acetylene per casting. It is claimed that washing-off the stubs means a saving of 50 to 60 per cent on the grinding costs.

• • •

An elaborate study of impact resistance of cast iron and its notch-effect sensitivity indicates that test pieces less than 1 square centimeter (0.155 square inches) in cross section are unsuitable, and that the rate of blow has an important effect on impact value. Comparable results are obtained only by careful standardization of test piece shape, method of support, and rate of blow. Low carbon content and suitable heat treatment have a beneficial effect on impact strength. Addition of nickel and chromium further increases the toughness. General quality of cast irons has an important effect on toughness, and in good quality irons of low carbon content, a considerable degree of toughness can be obtained even in the presence of high phosphorus.

• • •

Copper-silicon alloys weld best when the oxy-acetylene process is used with a concentrated flame and small weld pool. They should be welded as quickly as possible to forestall heat flow into the surrounding area with its resulting expansion and subsequent contraction. A slightly oxidizing oxy-acetylene flame with about 10 per cent excess of oxygen is claimed to yield welds which are much better than those made with a neutral flame.

• • •

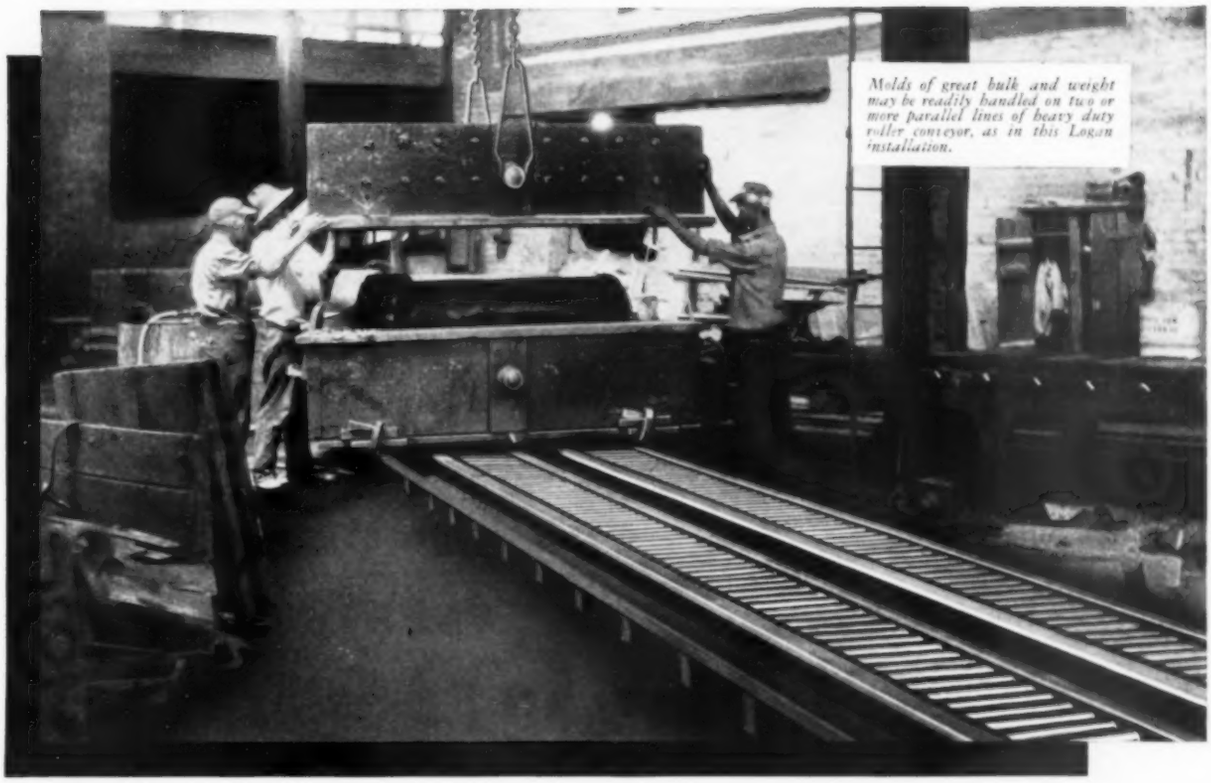
OVER 25,000 cast steel tender frames and more than 3000 cast steel underframes for freight cars now are in service. The underframes cover almost every type of car. Largest single order was for a lot of 1500 flat cars built in 1934 by the Pennsylvania railroad. The cast steel underframe makes the freight car embodying it a much stronger unit and it is claimed almost indestructible even in a wreck. Many of these underframes are veterans of quite severe accidents in which other cars of conventional construction in the same wreck were damaged badly or destroyed.

• • •

Solid matter in smoke, fume, etc. can be precipitated by passage through a tube in which standing sound-waves are established. The best method is to adjust the length of the tube so that the waves reflected from the upper end are in phase with the original waves set up at the bottom end. The wave length used should be about that of the tube diameter, and for a practical tube diameter the waves will range from 3 *to* 20 *kilocycles per second.*

• • •

FRACTURE of a piece of bronze exhibiting red, brown or multi-colored patches in its interior indicates that it has not been poured at the proper temperature, and not that it has been oxidized, stewed, or not mixed properly.



Molds of great bulk and weight may be readily handled on two or more parallel lines of heavy duty roller conveyor, as in this Logan installation.

Did you get YOUR COPY *of this new bulletin?*

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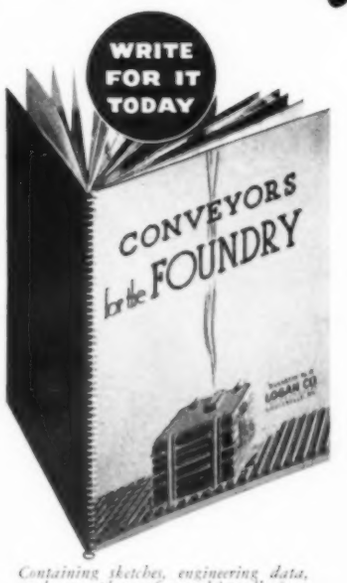

Containing sketches, engineering data, and many photos of actual installations.

POINTING the way to what's new and practical in foundry conveying, Logan Bulletin 15 should be in your files for ready reference—whether or not you are contemplating conveyors now.

Described in this book are typical installations, under conditions similar to your own, which will in all likelihood indicate similar savings for you. Of prime interest, too, are roll cross sections. The Logan Foundry Roll bearing has all-steel seals, it revolves as freely as a plain bearing because it has no felt washers.

The above and other outstanding construction features are covered in detail in Bulletin 15. A copy is yours for the asking. Write, on your letterhead, for one today.

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LOUISVILLE

R. E. Olds Hall of Engineering at Michigan State college, East Lansing, Mich., where foundry conference was held.

Michigan State Meeting Considers Testing

APPROXIMATELY 100 attended the fifth annual Foundry conference held at Michigan State college, East Lansing, Mich., April 9-10, under the joint sponsorship of the American Foundrymen's association, the Detroit Chapter of the A. F. A. and the Michigan State college. Judged by the value of information and discussions presented, this was the most successful conference yet held, although attendance was not as large as at some previous meetings, due in some measure to the conditions in the Detroit area which prevented many Detroit foundrymen attending.

Many Schools Interested

Robert E. Kennedy, technical secretary of the American Foundrymen's association presided at the first session Friday a.m., April 9, in R. E. Olds Hall of Engineering. In opening the meeting, Mr. Kennedy expressed thanks of co-operating organizations to Michigan State college for the invitation to meet there and to C. C. Sigerfoos and W. L. Cockrell of the faculty for assistance in staging the event. He pointed out that, following Michigan State's example, demand for similar conferences was increasing throughout the country, and indicated that at least eight technical schools wish to present similar conferences during the coming year. He also stated that a telegram of greetings had been dispatched to Massachusetts Institute of Technology where a similar conference was being held. A paper "Testing of Materials with Particular Regard to Cast Iron," was presented by Dr. R. Schneidewind, University of Michigan, Ann Arbor, Mich., at the first session. Dr. Schneidewind prefaced his remarks with an historic outline of the testing of materials, mentioning the first recorded test used in Damascus to investigate the famed swords manufactured there. In general there were four different types of tests, namely; Actual service, accelerated service test, accelerated model service test, and physical test.

Described Testing Methods

Dr. Schneidewind discussed in turn the methods used for making the hardness test of cast iron; tensile test, transverse test, impact test and the repeated impact test. With regard to the latter, he pointed out that it was rather difficult to interpret this test in terms of service. He also pointed out that alloys have a different effect upon impact resistance. With regard to wear testing, the speaker stated that in general two types of friction machines are used, one to determine sliding friction and the other rotating friction. He believes that structure determines to a large extent the wear resistance of materials and that variation of structure was extremely important.

Throughout his paper, Dr. Schneidewind emphasized the need of better interpretation for present tests results rather than the necessity for new tests. In work conducted at the University of Michigan, some interesting results have been obtained by determining the ratio of the tensile strength to brinell hardness. He has determined that in cast iron where this ratio is 200 or more, the indications are that the irons are good, well made and thoroughly deoxidized. Ratios between 180 and 200 represented the average run of the mine irons and ratios 180 and below, indicate poor irons which generally are badly oxidized.

Dr. Schneidewind also gave an interesting illustration of the plastic work in cast iron and methods of calculating it. He showed that by his method it is possible, assuming modulus of elasticity at ¼ ultimate strength, to calculate the plastic work to within 0.5 per cent. In commenting upon machinability, Dr. Schneidewind said that uniformity over a range of section is absolutely essential in irons. In his closing remarks, the speaker again emphasized the need for more intelligent interpretation of present test data with service data.

Presented Lively Discussion

A lively discussion period followed the presentation of the paper and in which Messrs. H. W. Dieterf, Harry W. Dietert Co., Detroit; W. H. Spencer, Sealed Power Co., Muskegon, Mich.; R. G. McElwee, Vanadium Corp. of America, Detroit; W. E. Jominy, General Motors Corp., Detroit; H. B. Hanley, American Laundry Machinery Co., Rochester, N. Y.; G. P. Phillips, International Harvester Co., Chicago; S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago; Frederick G. Sefing and Fred J. Walls, International Nickel Co., New York; Wayne L. Cockrell, Michigan State college; contributed.

Mr. Dietert was considerably interested in the method of the determination of the modulus of resilence. He also commented upon the effect of deoxidized metal on that property. Mr. Spencer referred to the well known fact that melting varies considerably with the weather conditions and expressed the opinion that hydrogen exerts a considerable effect on grain size, particularly in chilled sections. With regard to impact tests, Mr. Massari pointed out that in chilled iron car wheels, the drop test is used as a test for serviceability. He pointed out that sometimes a wheel with high laboratory test properties fails in service. He is of the opinion that at times high stresses retained in the wheel even after heat treatment, may help to resist certain service stresses. Mr. Sefing stated that in his opinion wear resistance and damping capacity are two of the most imporant properties of cast iron.

Mr. Walls reiterated Mr. Sefing's statement and stated that his company had been securing some interesting data on damping capacity and that there was some possibility that damping testing might eventu-

(*Continued on Page* 67)

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(*Continued from Page 62*)

ally lead to a better understanding of creep phenomena. He also pointed out his investigations and indicated that there might be a possibility of correlation of structure with certain properties, and that the austenite retained in the pearlite might have some influence. He also commented on the possibility of a blue brittleness range for cast iron.

A. J. Herzig, Climax Molybdenum Co., Detroit, was chairman of the afternoon session. After opening the meeting, Mr. Herzig introduced Garnet P. Phillips, metallurgist, International Harvester Co., Chicago, who presented a paper entitled "Adaptability of Gray Iron as an Engineering Material." Mr. Phillips stressed particularly the wear resistance of cast iron and the wide range of hardness that is possible. He stated there is no correlation between hardness and wear resistance. In referring to the heat resistance of cast iron, he stated that plain cast iron is used in installations where the temperature ranges from approximately 700 to 900 degrees Fahr., and that in high temperature service up to 1500 degrees Fahr. the low alloy irons are being used. However, a high alloy type cast iron has been made to resist temperature as high as 1900 degrees Fahr.

Discussed Physical Properties

In discussing physical properties, Mr. Phillips stated it is possible to secure irons in a wide range of tensile strengths varying from 15,000 to 80,000 or more pounds per square inch. He also emphasized the importance of the high compressive stress possessed by cast iron. He then discussed in turn transverse strength, impact resistance, shear strength, torsional strength and endurance of cast iron. He also pointed out that heat treatment is coming into use, especially the aging treatment, and that in many cases quenching and drawing are being used to confer special properties for given uses.

The next series of papers on the program dealt with wear testing. S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago; Paul S. Lane, American Hammered Piston Ring Division, Koppers Company, Baltimore, Md., and W. E. Jominy, General Motors Corp., Detroit, participated.

Mr. Massari described the machine used for testing wear resistance of chilled iron car wheels and indicated the many problems involved. He stated that not only must car wheels withstand rolling wear but they are especially exposed to brake wear, a combination of rolling friction and brake wear, and finally sliding friction. He then explained the difficulties that had arisen in designing a machine which would simulate service, yet give accurate results. The speaker believes this has been accomplished and that the present machine is accurate for the particular purposes.

Mr. Lane described the wear testing machine that was being used by his company with very good results to test piston rings. In many instances results obtained from the machine actually have been borne out in service tests. The machine described is a dry wear test in which the amount of wear is determined by the weight loss of the specimen being tested. After much research, the speaker has reached the decision that larger grain size together with normal graphite gave better wear resistance than the eutectic graphite and small grain size.

Mr. Jominy described the wear testing machine that was being used by the General Motors Research laboratory and which had been developed under the direction of A. L. Boegehold, director of the laboratory. He pointed out that in an automotive cylinder there are many effects to be considered, some of which are as follows: Surface friction, pressure, lubrication, atmosphere, load application, speed of travel, rubbing surface, etc.

He pointed out that the introduction of the lubricant in wear testing added a variable that is difficult to control but that this difficulty has been overcome in the machine he described. He particularly emphasized that there is no relation between wear and hardness and was inclined to agree in some measure with the findings of Mr. Lane.

A considerable discussion followed the presentation of these papers the gist of which finally was expressed by one member who stated it is quite evident that wear tests would have to be developed for the particular type of wear being tested and that no one machine could be designed to take into consideration all of the various factors involved in all problems.

Approximately 75 attended the annual dinner held in the Michigan State college union building, Friday evening. L. G. Korte, chairman of the Detroit Chapter of the A.F.A., was originally scheduled to preside as chairman but was detained unavoidably and J. D. Stoddard, the Detroit Testing Laboratory, Detroit, ably presided in his place. Following the dinner, short talks were given by H. B. Hanley, director elect of the A.F.A.; Robert E. Kennedy, technical secretary of the A.F.A.; Dean H. B. Dirks of the College of Engineering, Michigan State college, and H. W. Johnson, chairman elect of the Chicago Chapter. The gathering then was entertained by a skit produced by the students of the university under the direction of Prof. Nichols, in charge of dramatics.

Following the entertainment, Chairman Stoddard introduced C. C. Carlton, vice president, Motor Wheel Corp., Lansing, Mich., and president, Automotive Parts Manufacturers association, who gave an extremely interesting and timely talk on present conditions. He entitled his talk, "Fair and Equitable," and used the slogan throughout his talk applying it directly to the cause of the citizens of the country.

H. W. Dietert, H. W. Dietert Co., Detroit, presided at the Saturday morning session. Dr. R. A. Smith, Michigan department of conservation, Lansing, Mich., spoke on "Artificial Molding Sands" and R. E. Aptekar, American Brake Shoe & Foundry Co., New York, on "Core Making."

Described Michigan Sands

In his talk, Dr. Smith outlined the work that was being done in Michigan to determine the availability of sand deposits in the state, and work that the conservation department is doing to make the sand deposits in the State of Michigan usable to foundries. The speaker outlined the theory of glacial deposits of soil and compared the soil life of Michigan with that of the surrounding states.

Mr. Aptekar in his paper covered thoroughly the subject of core making. He began with the care that should be taken in the selection of sand for core making purposes, and explained that grading and blending were two important points to be watched. He then described the various types of binders used for cores including oils and cereal binders and explained the use of various additions that are made to linseed oil for the purpose of enhancing its properties.

He then described in detail the various types of core coatings, methods of mixing core sands, design and proper ventilation of core ovens and finally methods used for core drying. In all, Mr. Aptekar's talk was extremely interesting and informative. During the discussion period, a telegram was received from the M.I.T. conference reciprocating the best wishes of the Michigan State conference sent the previous day.

Following the meeting, it was the general opinion of those present that this second day meeting had contributed some extremely valuable information to the foundrymen on the manufacture of cores and it was announced that Mr. Aptekar's paper would be published in a pamphlet now being prepared by the Foundry Sand Research committee of the A.F.A.

When in doubt, ask a policeman

The Adventures of Bill

—by Pat Dwyer

COMING down on the stream lined Hiawatha the other night from Milwaukee to Chicago, Bill was moved to remark that God was in his heaven and all was right in the world. Lacking familiarity with the works of the late Mr. Browning he did not use the exact words of the quotation. In fact what he actually said was: "Well sir, after what you saw this week, I hope you are willing to admit that everything is hotsy-totsy and the foundry business once more is riding the crest of the wave. Let this be a lesson to you, my lad. Teach you to maintain a face of normal dimension in periods of temporary-er-ah-inactivity instead of going around as you have gone around the past 4 years with a puss as long and as sour as that of old Scrooge on Christmas eve."

While admitting that the exhibition and convention, the attendant enthusiasm, interest in the various sessions and the *Sold* signs on many pieces of equipment indicated a rising tide in the foundry industry, still I did not consider the situation warranted shouting at the top of his voice. I did not hesitate to tell him so, definitely. Particularly I objected to the sour puss reference and the totally irrelevant and uncalled for coupling of my personality with the late Mr. Scrooge. I trust I am not unduly sensitive, but I did not exactly fancy having the eyes of all the passengers in the car turned in my direction.

"Let 'em look," Bill remarked carelessly. "I have been looked at, looked up to and looked down upon dozens, perhaps hundreds of times in the course of a long and somewhat varied career and I cannot say that the looks at any time did me any good or any harm. They did not cause the old pulse beat to vary by a hair of one per cent, or cause any rise or fall in the old mental barometer. However, don't get me wrong. I am referring now to strangers, people I don't know, people I never saw before and in all probability never may see again. The list also includes certain people I know, but of whom I truthfully can say that if I never see them again, it will be too soon.

"On the other hand and just to show what a heart of gold beats under this ragged old waistcoat I never fail to thrill at the look in the clear, candid eyes of a child. There is also another kind of a look—I knew a girl one time—She had a pair of brown eyes—Here, here! Who started this thing, anyway?"

"Pray continue," I said. "You interest me strangely, stranger. I would hear some more about this winsome maiden with the eyes of brown. Soft—the eyes of course—no doubt as those of a doe in some bosky dell, deep and steady as the stars above, while you held her little hand in your's, or vice versa, and told her of your love! When she hung her head and blushed and then peeped up at you from under long, curling lashes, you thrilled from head to toe and broke out into one of them there rashes!"

Birds of a feather. Some feathers

"Can the baloney," Bill growled. "Because I slipped for a moment into a memory of 40 years ago is no reason for you to think you are one of the tin pan alley boys with a perfect lyric for a crooner. I could do a better job with my eyes shut and with one hand tied behind my back. With both hands tied and with a hobble around my neck. Listen: When you reached for her hand, the lady said 'Bah! Keep your hands to yourself or I'll call my Da!'

"However, all that holding hand stuff—interesting of course to the parties of the first and second part, and mildly nauseating to any casual onlooker—all that hand holding stuff is far removed from the subject I had in mind when I commented on the convention and exhibition and the present state of the foundry industry."

"Kindly correct me if I am in error, but so far as I can remember *I* did not introduce the subject of brown eyes. I might appeal to some of the other passengers whose eyes and ears—thanks to your foghorn voice—are bent in this direction, but I prefer to let you figure it out for yourself. Only two of us here in the seat. To simplify the problem as much as possible let us call the two parties *A* and *B*. *A*, a gentleman of irreproachable reputation, character and morals, raises his right hand and claims he was out of the city when the alleged statement was made. On the other hand, *B* is a low fellow with a foundry training and background and there-

(*Continued on page* 72)

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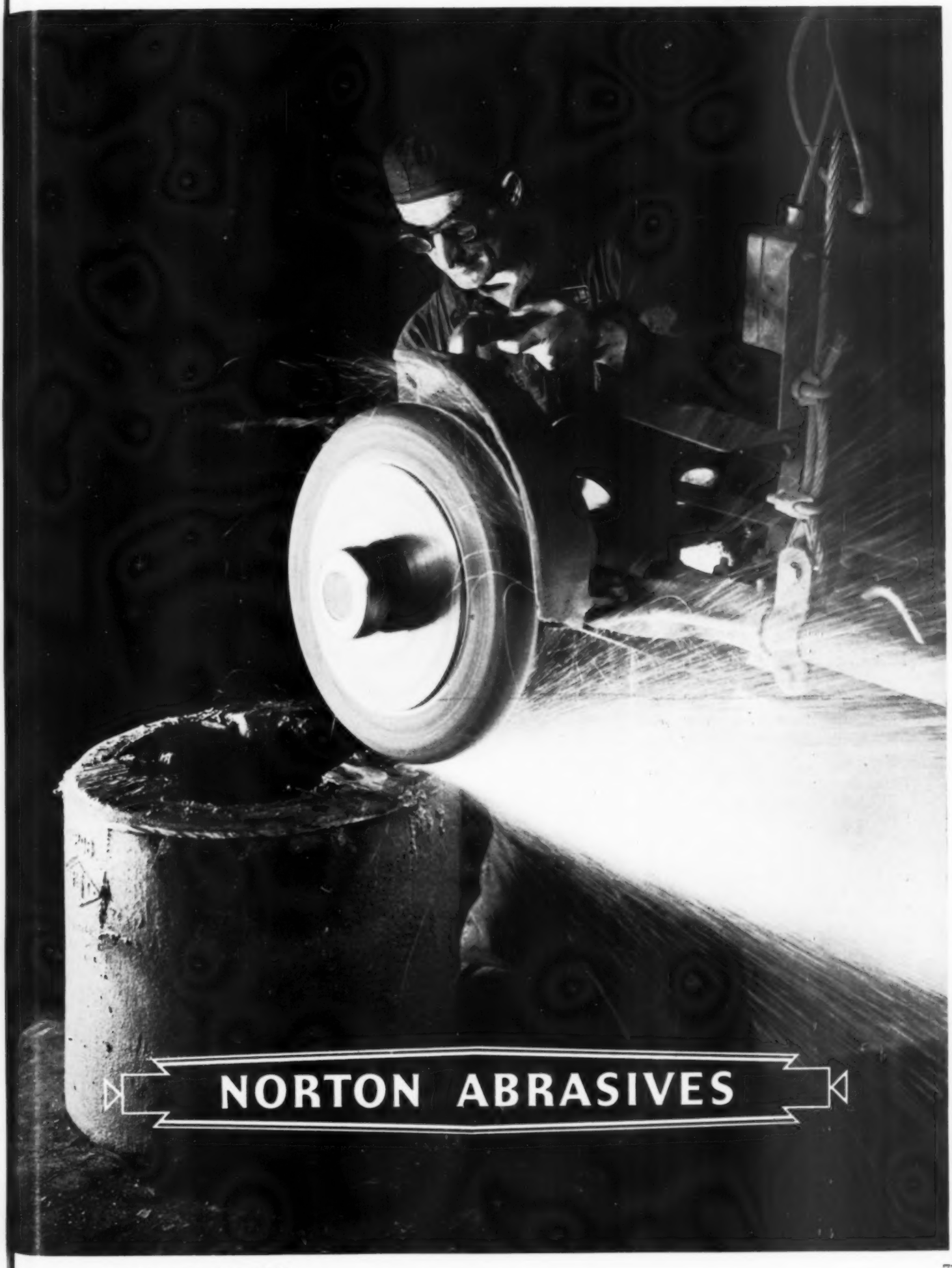
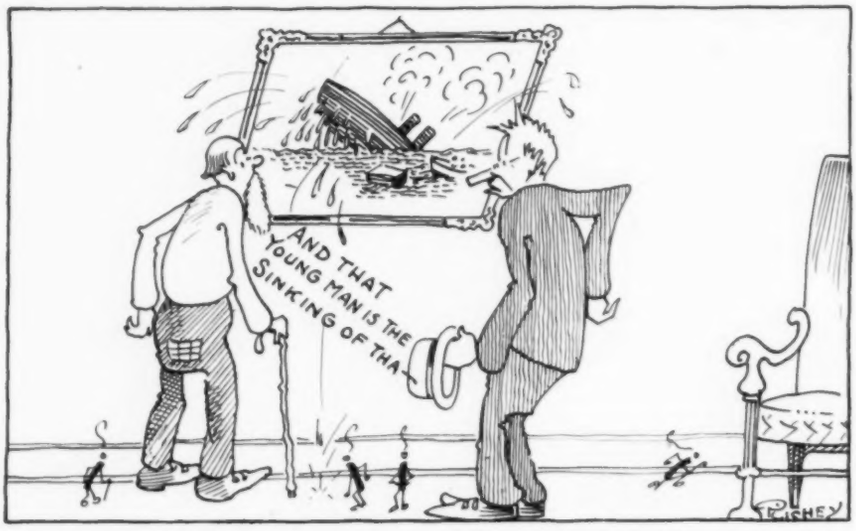


(*Continued from page* 68)

fore somewhat addicted to exaggeration and hyperbole. Only one conclusion is possible. Your honor, the defense rests its case."

"Okay, Okay," said Bill wearily. "So what? If you keep up that everlasting and useless line of interruptions, this stream lined whizzer we're on will be into Chicago before I have a chance to say a word. Once upon a time this was a leisurely 2-hour trip where a man had time to put away a dining car meal, smoke a pipe or two and maybe catch an odd cat nap. On this long yellow snake logging about 90 knots on the straightaways and practically the same around the



Another mystery of the sea. She now has two stacks

curves, you have to snap at the grub pretty lively to get your full share before some one pokes his head in the door and yells, 'Chicago, Union Station, Chicago!' "

"I suppose, following your usual custom, you did not do any prowling around Milwaukee. Just stuck to the old routine and beat a little rabbit path for yourself between the hotel and the Auditorium, hey?"

"Why should I prowl around the town? I have been in the city before on several occasions. Anyway, all big towns are alike. When you've seen one, you've seen them all. The hotels are alike, the stores are alike and the cops are as coldly indifferent when you ask for information in one town as they are in another."

"Well," said Bill. "I won't argue about the hotels and the stores. I only use one as a sleeping place, and I never go into the other, but you have the cops all sized up wrong. As friendly a bunch in Milwaukee as ever I ran into. Must be something in your manner or approach that puts 'em on edge. Come out of your cellophane wrapper once in a while. Learn to smile. Take a leaf out of your uncle Bill's notebook on the how, where and when to apply a few drops of banana oil or a little sweet oil on a feather. I have heard that politeness and courtesy ease one's path through life. However, there is quite a distinction between true courtesy and the fake or surface variety that fools no one and only rouses antagonism. Courtesy and politeness form a nice foundation, but for a real, smooth journey without bumps, jolts or collisions, nothing so far discovered equals a mild, judicious application of the good old banana oil. Brother, it never fails.

"You also are mistaken in the broad general statement that all towns are alike. Every town has its own distinctive features, but you cannot expect to find them if you remain like a snail in its shell. F'rinstance in a local life saving station where I popped in the other day for a quick one, I met a sociable lad who told me of the existence of an organization known as the Old Settlers Club. He regretted that he could not accompany me in person—half an hour late for an appointment at that precise instant—but he gave me explicit direction for finding the club room at 225 East Michigan street. 'You'll always find some of the members there,' he said, 'and any one of 'em will be glad to talk to you. Tell 'em you are an old friend of mine. I am not a member, but my father is one of the original crew.' "

"The boys of the old brigade, eh? I suppose yo' tuk yo' foot in yo' han' and galloped down right smath to find a hole in the wall up some dark alley where three or four old relics were fast asleep or gummily disputing over a game of checkers."

"That's three times you have guessed wrong in the past half hour. Three strikes and you're out. I found a large, well appointed club room on the ground floor of an imposing office building. Several citizens, hale and hearty boys who no doubt did their full share in converting Milwaukee from a sprawling country town into its present metropolitan position were seated at tables here and there. Of course I would not want this to go any farther, but from my own slight knowledge of the game I suspect they were engaged in that wicked card game known as poker. Beyond a brief, passing glance they paid no attention to me, either at the moment of entrance or at any time afterward while I rambled around viewing the souvenirs, relics, pictures, books and other objects of interest on the walls, the floor and in glass cases.

"Fortunately I found a charming old gentleman sitting by himself. Recognizing me as a stranger and a pilgrim he courteously intimated that I was welcome. If he could be of any assistance, his time and—er—ah—any information he had, were at my disposal. Later I discovered that he is the librarian of the club and that everything connected with it constitutes his chief hobby. I could not have fallen into better hands.

"A faded hand bill on the wall calling on young men to enlist in the Union army in the early days of the Civil War reminded my guide that as a boy he had stood on the curb outside the building and watched troops marching away to the music of fife and drum and with banners gaily streaming in the breeze. From his appearance I had assumed that he was somewhere between sixty and seventy. He modestly assured me that he was eighty-four! Apparently the air of Wisconsin has marvelous preservative properties.

"Another exhibit that attracted my attention was an illustrated page from a New York paper describing one of the major tragedies of the Great Lakes, the loss of the LADY ELGIN in Lake Michigan, the night of Sept. 8, 1860. The vivid imagination of the artist had led him to show the vessel enveloped in flames, going down by the stern, with the bow high in the air, while the water all around was thickly populated with boats, rafts, barrels, boxes, and members of the passengers and crew waving their arms and apparently shouting in the greatest excitement. Quite a tribute to the artist's imagination.

"My guide deplored this lack of accuracy, this straining after sensation which apparently was as dear to the heart of a newspaperman then as it is now. Outside the fact that the steamer was *not* on fire and did *not* go down by the stern the picture was not far astray. The

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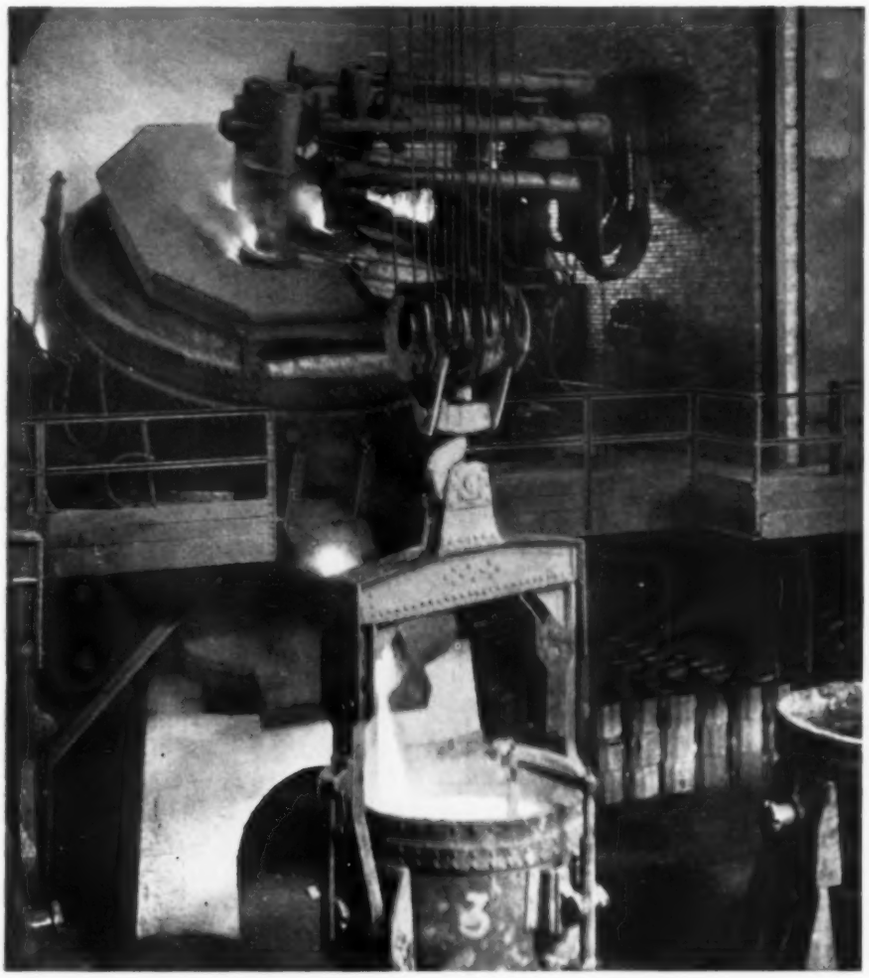
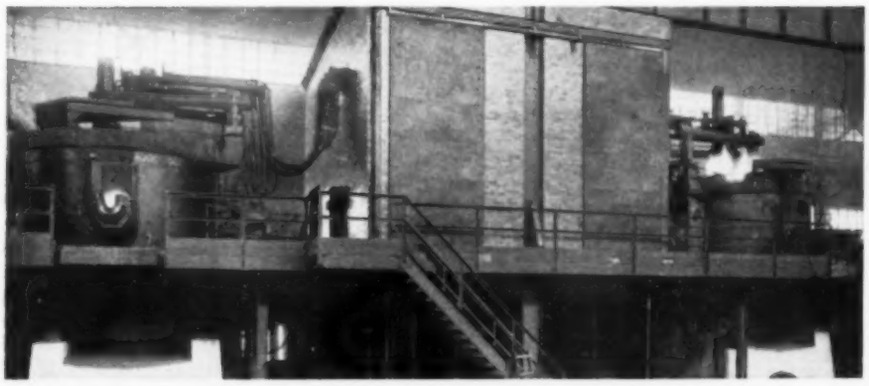
Want *half a ton*?
...or 100 *Tons*?



(Above) ***Pouring one of this pair of Type 25 Heroult Electric Furnaces.***

(Below) ***A double installation of Type 25 Heroult Electric Furnaces.***



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UNITED STATES STEEL

New England Foundrymen Hold Regional Conference

WITH a program covering all phases of foundry practice, from pattern design to machining, 400 attended the first New England Regional Foundry conference held at the Massachusetts Institute of Technology, Cambridge, Mass., April 9-10. Sponsored by the New England Foundrymen's association, the American Foundrymen's association, M. I. T., and other allied technical groups in the district, a wide variety of subjects pertinent to gray iron, steel and nonferrous castings were discussed. In attendance and general interest the conference was considered one of the most successful metal trades events held in the New England district in recent years.

Arrange Plant Visits

In addition to the well balanced program, the arrangements committee, R. F. Harrington, Hunt-Spiller Mfg. Co., Boston, chairman, provided several plant visitations where metals processing, material testing and other practical foundry operations were demonstrated. Speakers at the dinner, Friday, April 9, at Walker Memorial hall included: D. M. Avey, secretary-treasurer, American Foundrymen's association, Chicago; Walter M. Saunders, Jr., president, New England Foundrymen's association; Dr. Karl T. Compton, president, Massachusetts Institute of Technology, and Merwin Horn, photographic service, M. I. T.; the latter giving a demonstration of high speed moving pictures. District representatives of foundry supply companies were in charge of registration and reception.

An outstanding contribution to the technical program was made by Vincent T. Malcolm, metallurgist and director of research, Chapman Valve Mfg. Co., Indian Orchard, Mass., who discussed modern trends in steel casting development and devoted much attention to casting defects, due frequently, in part, to faulty pattern design.

Outlining advantages of flexibility in pattern equipment, E. M. Phillips, General Electric Co., Lynn, Mass., advocated that turbine castings patterns be designed in sections. E. H. Ballard, of the same firm, presided at the first technical session. By designing patterns in sections, Mr. Phillips declared it was possible to change any given part without greatly changing a pattern as a whole. This also permits minimum costs and is an aid in peak production periods. The designer also should consult with the foundry and pattern shop to attain best results, as that often permits reducing machining operations on the finished casting.

Several Important Factors

With some patterns, it is desirable to designate type and analysis of iron to be poured and Mr. Phillips illustrated that by indicating some alloy cast irons for higher strength material. Turbine castings also must be planned to withstand internal pressures and temperatures. Control of pouring temperature and in the use of sand and other materials is also important.

Dean Smalley, General Electric Co., cited examples of reductions in costs by changes in design without injury and often improving the pattern itself through cooperation between the pattern shop and foundry. Savings of $20,000 annually are attained by one small foundry through such cooperation. Charles F. Miller, Fairmount Foundry, Woonsocket, R. I., declared the great variety of castings makes such interdepartmental collaboration imperative. E. L. Bartholomew, United Shoe Machinery Corp., Beverly, Mass., contended that the possibilities in heat treating and metallurgy in gray iron production had hardly been touched, both having lagged far behind progress made in steel by these sciences. For the reduction of weight and greater strength metallurgists should be consulted in the design of patterns.

Around the subject of high tensile cast iron, a warm debate developed. E. H. Ballard stated that iron foundries able to produce 100,000-pound strength castings had lagged behind steel, aluminum and other materials in marketing such products. The question of such high tensile iron being generally commercially desirable at this time was discussed.

Vincent T. Malcolm declared high test iron required detailed care in the designing of patterns. With R. F. Harrington, he agreed that while high test iron has a place commercially and is available, foundrymen should be cautious in developing the material on a production basis. The matter of wear was stressed by several. Some irons of less tensile strength show better wear for certain specific uses. Presence of graphite is a factor, several agreed. Competition with rolled plates, welding and the reduction of the number of alloys in iron castings also entered the discussion.

Harold J. Roast, Canadian Bronze Co., Ltd., Montreal, discussing pattern design for bronze castings, also stressed cooperation between all foundry departments and the importance of the choice of alloys for special uses. Corrosion and economic factors which may force the use of inferior metals were also discussed.

Described Cupola Operation

In cupola operation the smallest diameter to fulfill requirements is desirable, according to Donald J. Reese, International Nickel Co., New York. However, in view of 2000 cupola installations in the country annually on a average, future needs should be considered, four to five years being a minimum in planning new installation. Accessory equipment, especially the blower is important; also control of the amount of air in the cupola. For every ton of material utilized, Mr. Reese claimed an approximate amount of air goes up the cupola.

While not thinking of air in terms of dollars, he declared it imperative to know how much air a foundry is using. A 20 per cent air loss is frequent and in some plants it is sometimes over 50 per cent. Measuring equipment is partly nullified, however, by leaky connections and inferior piping. The pressure gage, too often, is not given the attention deserved. He likened this equipment in cupola operations to the stethescope of the physician. Size of coke in relation to the diameter of the cupola is another factor.

Generally speaking, he said, the

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proper relationship of a size would be one-twelfth of the diameter. Ideal size of scrap is approximately 30 per cent of the cupola diameter. In addition to the size of the material, its weight should also be considered. The cupola as a heat generating unit, rather than a melting unit is also advocated. Temperature and moisture in the air are given too little attention, water in the air accounting in part for varied performances by this same cupola. The bed height and wind box pressure ratio figures were also charted by Mr. Reese.

Professor J. M. Lessels, Massachusetts Institute of Technology, outlined a series of results in the testing of cast iron which was fol! ved by a laboratory visitation and demonstration at the institute. Sand control and testing, covering molding sand properties and control at atmospheric and elevated temperatures was reviewed by W. G. Reichert, Singer Mfg. Co., Elizabethport, N. J. Various techniques used in foundry sand and testing were discussed by Earl E. Woodliff, Harry W. Dietert Co., Detroit.

In addition to Mr. Ballard, chairmen at the technical sessions included: Col. G. F. Jenks, Watertown arsenal; Professor R. S. Williams and Professor A. L. Townsend, M. I. T.; Charles F. Miller, Fairmount Foundry, Woonsocket, R. I.; R. F. Harrington, Hunt-Spiller Mfg. Co. and A. S. Wright.

Micro examination of cast metals, transverse tests of cast iron and tensile tests of cast iron were demonstrated in the metals processing laboratories of M. I. T. Other demonstrations · included tensile strengths on rolled steel, worked nonferrous metals, cast nonferrous metals; compression tests on low carbon steel, cast iron, and fracture of ductile and brittle types; bend tests on cast steel, crystallization experiments and photoelasticity, and fatigue demonstrations.

The Adventures of Bill

(*Concluded from page* 72)

Old Settler remembered the event and told me the story.

"The side wheel steamer with over 300 members of the Independent Union Guards, their families and friends left Milwaukee and ran down to Chicago, where 50 additional passengers joined for the trip up to Lake Superior. Officers and crew numbered 35, a total of about 400 people on board when the steamer left Chicago about midnight. Two hours later, while threshing her way north in the teeth of a gale she was rammed by a lumber laden schooner and sank in 20 minutes in 50 fathoms. Approximately 300 people were drowned. The remainder clinging to various pieces of wreckage were washed ashore in the morning.

"Behavior of the schooner's captain strongly paralleled the behavior of some modern automobilists. The inquest developed that he had seen the steamer's lights for half an hour before the collision, while he himself ran without lights. On a southeast course and with every sail set except the gaff topsail he apparently had attempted to cross the steamer's bow. At the last moment he threw up his helm in an attempt to pass to port with the result that he rammed the steamer amidships on the port side, tore away her port wheel and smashed a great gaping hole in her side. In the storm and darkness he worked free and continued on his way to Chicago where next morning he reported a collision with an unknown steamer. Just that and nothing more!"

"And I suppose," I said, "the judge fined him $5 and costs with the fine suspended."

Organize Research Foundation

Ohio State university, Columbus, O., has completed the organization of its new research foundation. Incorporated last November, the foundation has been designed to bring about closer co-operation between the university and industry, particularly to make the university's laboratory and research facilities more helpful in the solving of industrial problems.

Represent Firm

The American Engineering Co., Philadelphia, has appointed the following new representatives to handle the sale of its line of electric hoists: James B. Barton Jr., 708 Mortgage Guarantee building, Atlanta, Ga.; J. A. McCoy, 1436 Forty-first place, Des Moines, Iowa; George R. Douglas, 703 Columbia Mutual Tower, Memphis, Tenn.; F. E. Bennett, 614 Northwest Sixth avenue, Portland, Oreg.; Murray-Jacobs Co., 528 First avenue, South, Seattle; F. H. Gill, 8113 Colfax avenue, Chicago; C. G. Forshey, 304 M & M building, Houston, Tex.; L. E. Kenney, 314 Pan-American building, New Orleans; E. V. Brown, 417 Market street, San Francisco; Hart Machinery Co., 2613 Fourth avenue, Tampa, Fla.; and Peter H. H. Dunn, 1131 Woodward building, Washington.

Sets Forth Aspects Of Safety

E. O. Jones, director of the safety and hygiene division, American Foundrymen's association, Chicago, spoke on the "Practical Application of Safety in the Foundry" at a meeting of the Northern Illinois Foundrymen's association held April 13 at Hotel Freeport, Freeport, Ill.

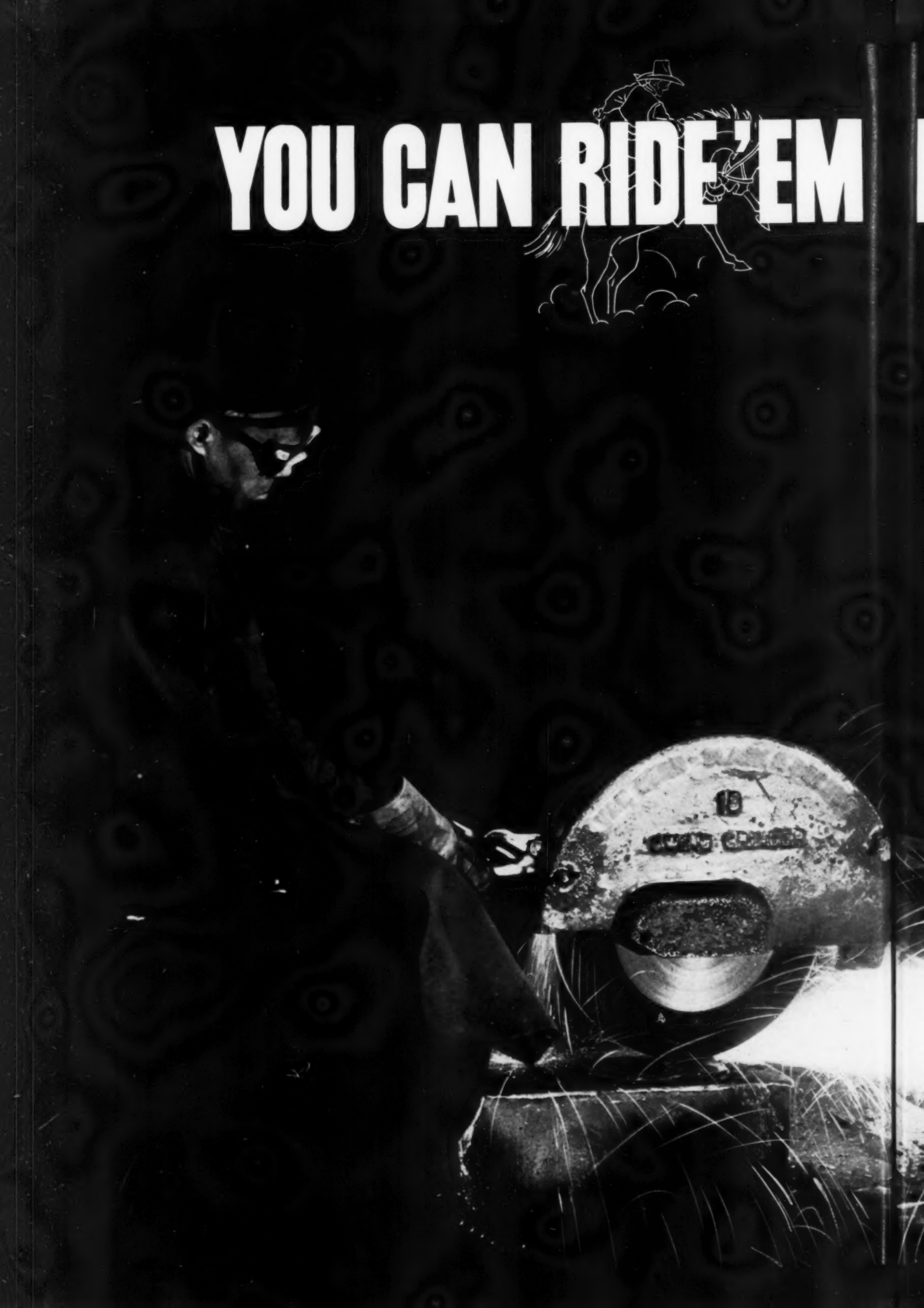
Mr. Jones opened his talk by giving a short history of the work on hygiene in Wisconsin foundries. He then took up the problem of dust from the standpoint of prevention and economical handling. He gave some methods of eliminating dust including the use of water under pressure; water and air; the vacuum cleaner; brushing; low pressure steam; and the dust respirator.

Mr. Jones stated that floor dust should not be allowed to accumulate and should be wet down before cleaning. Careless use of the air hose was given as one of the chief sources of dust. He compared the Illinois, Wisconsin, and California codes in his concluding remarks, pointing out changes that had been made to make them more workable before final acceptance.

An added feature was provided at the meeting by William Romanoff, technical superintendent, H. Kramer & Co., Chicago, who showed a sound motion-picture of that company's production of brass ingots.

The following committees were appointed to arrange the annual picnic which will be held in June: Chairman, O. W. Josephson, S. Obermeyer Co., Rockford, Ill., and F. E. Rundquist, Greenlee Bros. & Co., Rockford; finance, J. C. Gore, Werner G. Smith Co., Chicago, Daniel E. Clifford, Hickman-Williams Co., Chicago, Lyle Manley, Manley Sand Co., Rockton, Ill., and P. A. Paulson, Gunite Foundries Corp., Rockford; golf and prizes, F. C. Rutz, Gunite Foundries Corp., Allen Mattison, Mattison Machine Works, Rockford, and B. C. Trueblood, Arcade Mfg. Co., Freeport, Ill.; games, F. B. Richards, National Sewing Machine Co., Belvidere, Ill., Walter Pfanstiel, W. F. & John Barnes Co., Rockford, and A. E. Murphy, Domhoff & Joyce Co., Elgin, Ill.; attendance and tickets, C. I. Waldo, Pickands Mather & Co., Chicago, H. S. Bennethum, Stover Mfg. Engine Co., Freeport, and Max Reutler, Fairbanks Morse Co., Beloit, Wis.; and entertainment, John Owens, Harbison-Walker Refractories, Chicago, and Mr. Clifford.

Swan-Finch Oil Corp. has moved its executive offices and New York sales office to 30 Rockefeller plaza, room 1605, R.C.A. building, west, New York.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Convention Inspires Industry To Meet Future Problems

(*Conclulel from page* 29)

Milwaukee's spontaneous hospitality.

A plea for further stimulation of interest in the foundry industry through activities of the American Foundrymen's association was made by James L. Wick Jr., Falcon Bronze Co., Youngstown, O., retiring president, at the formal opening session of the convention on Monday afternoon.

Mr. Wick paid tribute to the efforts of the Milwaukee chapter in arranging the convention and lauded the older members of the association who have led in the development of the industry. He also urged that the industry strive not only for the betterment of its products but also for the improvement of labor conditions, particularly through apprentice training.

Greeted by the Mayor

W. F. Bornfleth, Cutler-Hammer Inc., Milwaukee, and general chairman of the convention, welcomed the delegates to the convention. Greetings from the city were extended by Daniel W. Hoan, mayor of Milwaukee, who also besought his listeners to take a more active part in the affairs of local and national government.

The following message from the Institute of British Foundrymen was read by Frank G. Steinebach, editor, THE FOUNDRY and chairman, international relations committee: "Institute British Foundrymen sends cordial greetings to American Foundrymen's association. Best wishes for industrial prosperity and successful convention."

H. Bornstein, Deere & Co., Moline, Ill., newly-selected president, announced the selection of the following to select members of the nominating committee: W. B. Crawford, Atlas Foundry Co., Detroit; Walton Woody, National Malleable & Steel Castings Co., Cleveland; and W. L. Laird, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The following were named to the resolutions committee: A. E. Hageboeck, Frank Foundries Co., Moline, Ill.; Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; and Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh.

The annual business meeting of the American Foundrymen's association was held Thursday afternoon with President James L. Wick Jr. presiding. Frank J. Lanahan, Fort Pitt Malleable Iron Co., McKees Rock, Pa., and a past president of the association, presented the report of the nominating committee which was received, and the following officers declared elected:

President, Hyman Bornstein, chief chemist and metallurgist, Deere & Co., Moline, Ill.; Vice President, Marshall Post, vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; Directors to serve terms of three years each: Duncan P. Forbes, president, Gunite Foundries Corp., Rockford, Ill.; H. B. Hanley, foundry superintendent, American Laundry Machinery Co., Rochester, N. Y.; C. J. P. Hoehn, president, Enterprise Foundry Co., San Francisco; Thomas Kaveny, president, Herman Pneumatic Machine Co., Pittsburgh; and James L. Wick Jr., president, Falcon Bronze Co., Youngstown, O. For director to replace Mr. Post and serve for 2 years: C. E. Sims, supervising metallurgist, Battelle Memorial institute, Columbus, O.

Confer Life Memberships

Upon recommendation of the board of directors as presented by Dan M. Avey, secretary-treasurer of the American Foundrymen's association, honorary life memberships were conferred on James L. Wick Jr., retiring president, John W. Bolton, C. W. Briggs and J. T. MacKenzie, recipients of A.F.A. medal awards for 1937.

William B. Crawford, Atlas Foundry Co., Detroit, presented the report of the pre-nominating committee appointed by President Wick at the opening session. The following were voted members of the nominating committee and with the three immediate past presidents of the association will nominate the officers for 1938: Member, K. V. Wheeler, Lebanon Steel Foundry, Lebanon, Pa.—alternate, J. C. Pendleton, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; member, W. H. Doerfner, Saginaw Malleable Iron division, General Motors Co., Saginaw, Mich.—alternate, Leon J. Wise, Chicago Malleable Casting Co., Chicago; member, W. M. Ball Jr., Edna Brass Mfg. Co., Cincinnati — alternate, Charles E. Schley, Philadelphia Bronze & Brass Corp., Philadelphia; member, R. R. Deas, American Cast Iron Pipe Co., Birmingham—alternate, W. H. Winters, American Brake Shoe & Foundry Co., New York.

Robert E. Kennedy, technical secretary of the association, announced the winners of the apprenticeship contest, as presented on page 116 of this issue. John H. Ploehn, French & Hecht Inc., Davenport, Iowa, reported that the apprenticeship committee recommended to the Board of Directors that regularly indentured apprentices of member companies be allowed to purchase the bi-monthly Transactions of the association for $2 a year.

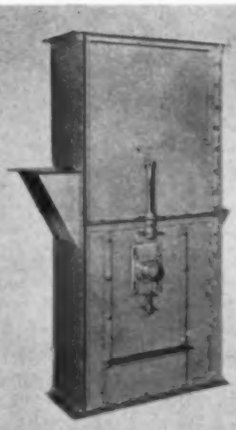
Resolutions expressing the deep regret of the association on the passing of Fred B. Erb and George Batty were passed unanimously.

Large Banquet Attendance

One of the outstanding events of the forty-first convention of the American Foundrymen's association was the annual banquet which took place Thursday night. Approximately 700 members and guests were present, and the program included singing by the Milwaukee Lyric Male chorus, presentation of three gold medal awards, and an address by Dr. James Shelby Thomas, Chrysler Institute of Engineering, Detroit, and Clarkson College of Engineering, Potsdam, N. Y. James L. Wick Jr., president of the A. F. A., acted as toastmaster.

The John A. Penton gold medal was presented by E. H. Ballard, General Electric Co., West Lynn., Mass., to John W. Bolton, Lunkenheimer Co., Cincinnati, O., in recognition of his work in metallurgy and the practical application of research to the advancement of the foundry industry. The William H. McFadden gold medal was presented by Major R. A. Bull, Chicago, to Charles W. Briggs, United States Naval Research laboratory, Anacostia, D. C., for his direction of important research and published writings on the metallurgy of steel castings. The John H. Whiting gold

(*Continued on page* 82)



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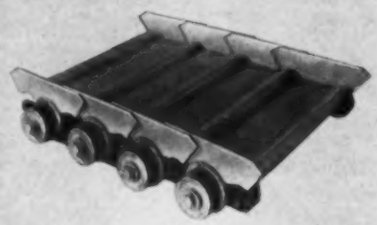
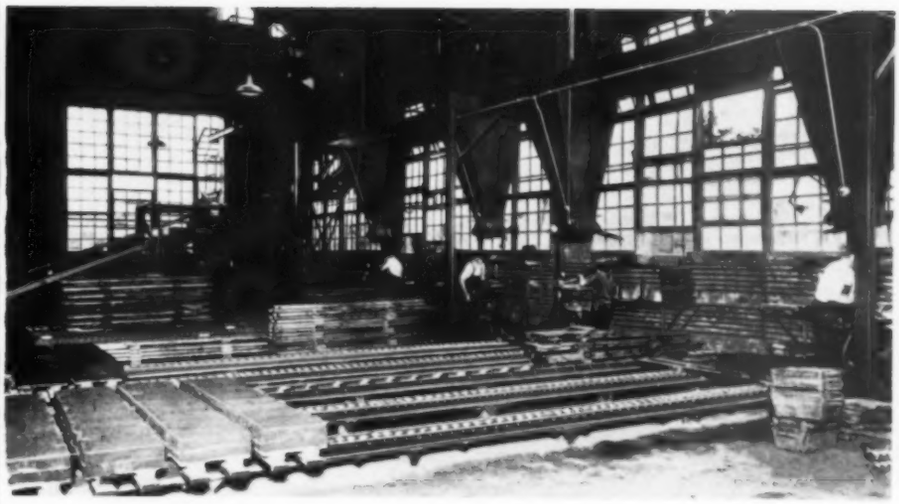


Leak-Proof Apron Conveyor

Duplex Bin Gate



Eastern Patented System handling delicate squeeze moulds on Eastern Precision Roller Conveyor.

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(*Continued from page 80*)

medal was presented by Dan M. Avey, American Foundrymen's association, Chicago, to James T. MacKenzie in recognition of his research and practical work in the advancement of gray iron foundry practice.

Dr. James S. Thomas discussed the influence of the machine on civilization, and pointed out that progress of the human race is based on materialistic and idealistic development. In this advancement the materialistic development always leads and supports the idealistic development. Dr. Thomas stated that history was a series of business adventures, and that employment of the machine is responsible for the greatest idealistic accomplishments in history—our present civilization.

Approximately 35 instructors from engineering colleges and technical high schools held their annual dinner meeting in connection with the A.F.A. convention. The informal discussion featured present-day problems of interesting graduates in following foundry work as a career. Foundries were criticized for not being willing to give the engineering graduate a sufficient wage to compete with other types of organizations hiring large numbers of college men. Several of those taking part in the discussion stated that the situation in the foundry industry rapidly is changing. Each year more college men become interested in foundry work and today the major engineering schools are finding it much less difficult to locate jobs for these boys. Tribute was paid to the work of the technical high schools, especially in Chicago, where considerable attention has been given to foundry apprenticeship.

Steel Founders Consider Design Problems

PROBLEMS relating to design, specifications, production and inspection of steel castings completely occupied the time of three technical sessions and a roundtable luncheon conference. Greatest interest centered about the subjects of design and inspection for it is in these fields that a need for education and enlightenment exists.

The topic of designing for steel castings was introduced by Major R. A. Bull, steel castings consultant, Chicago, at the first session at which H. D. Phillips, Dodge Steel Co., Philadelphia, presided. Major Bull presented excerpts from a preliminary manuscript for a booklet which the American Foundrymen's association has under preparation to guide mechanical engineers on proper design. This program for aiding designing engineers is sponsored by the association's recently constituted committee on design of steel castings. Having been delegated with the task of preparing the manuscript, Major Bull outlined the contents of the work and sought constructive criticism.

By its very nature, the information contained in the manuscript is intended for consumers of castings. The chief difficulties, the speaker pointed out, are encountered with large production castings; failures with jobbing castings do not become generally known for obvious reasons. Only two principles are recognized generally by designers, namely, need for uniformity of section, and need for avoiding sharp corners. Other factors must be recognized.

He mentioned that today's tendency for streamlining in design, that is, using curves for angles, has produced difficulties in the way of more intricate design. Contractional stresses, Major Bull stated, frequently are overlooked, thereby causing defects. Compromises in design must be made in the interest of production of sound castings. Symmetrical lines should be sought. He mentioned also that it sometimes is better to lighten some heavy sections than to make light sections heavier.

In discussion, one speaker inquired as to the effect of chemical composition on design and Major Bull replied that he considered the matter of composition best not be considered under design. Foundrymen should be permitted to use their best judgment in the composition so that the castings produced would meet specifications satisfactorily. C. W. Briggs, physical metallurgist, naval research laboratory, Anacostia, D. C., asserted that mechanical engineers must have specific rather than general information regarding proper design, otherwise, they will continue to produce designs along the same lines as those in the past.

Another speaker suggested that some castings difficult to produce might be made in two or three simple castings and then joined into one unit by welding. Major Bull stated that some work had been done along this line, but it has not advanced sufficiently that definite recommendations are advisable at this time.

F. A. Melmoth, vice president, Detroit Steel Casting Co., Detroit, declared the chances are that designers are simply producing shapes and they have little idea as to how these shapes will perform when translated into metal. He admitted this might be regarded as a rabid statement. In his opinion, every designer should have had some experience in foundry practice so that he has some understanding of casting difficulties.

One speaker had referred to castings showing cracks when the manganese content of the steel was too low. Mr. Melmoth referred to this comment and replied that in his opinion it probably was not a case alone of the manganese being too low but a case of some condition in the steel itself which made the manganese too low.

Presenting the report of the committee on methods for producing steel for castings, Mr. Melmoth, chairman, said 1936 produced no striking developments in steelmaking processes. He called attention, however, to revival of interest in the Perrin process used in France and other European countries.

Increase Melting Speed

This process claims, by producing an intimate mixture of slag and metal to so speed up the reactions occurring between the slag and metal that they occur in a very small proportion of the time normal in the orthodox steelmaking processes. The character of the slag can be verified to control the nature of the reaction desired, and when deoxidation is brought about by this means the claim is made that the oxygen content can be brought so low that the addition of silicon or aluminum produces no nonmetallic inclusions.

At the conclusion of this committee report, Jerome Strauss, vice president, Vanadium Corp. of America, Bridgeville, Pa., presented some interesting details of the Perrin process. He stated that it has been used in France for the past 7 years in connection with the acid open-hearth process and now is being applied to bessemer practice. It is being studied in the United States in connection with both the open hearth and bessemer processes. One advantage of the process is its reproducibility. At present, its suitability for steel for castings is not known.

J. M. Sampson, foundry engineer, General Electric Co., Schenectady, N. Y., presented the second report of the committee on test coupons, a committee of which he is chairman.

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ADVERTISING PAGES REMOVED

(*Continued from page 82*)

Actual soundness of a casting is the most important requirement in securing a good test result from any specimen, he emphasized. A specimen cut from certain sections so designed as to make it commercially infeasible to prevent axial shrinkage should be appraised with the knowledge that the lower density occurs at a point that is for all practical purposes the neutral axis of the member and has little effect on the serviceability of the casting. However, for those castings subjected to pressure and corrosion the physics involved in solidification legislate against this center section being regarded merely as an area of low density. It is a microscopic void connected to the outside by one or more openings.

Specifications for steel castings usually cover allowable minimum values to be met for acceptance as to physical properties. In only a few specifications is the size of the test piece mentioned. It is believed, the report stated, that when specifications are drawn up, the required physical properties are based on actual results obtained over a period of time by a group of foundries and that these results are obtained from relatively small test coupons cast as an integral part of or gated to the casting. The physical properties thereby obtained are only a comparative measure of the analysis and its subsequent annealing, rather than an actual measure of the properties to be found in any of the various cross sections of the casting itself, or in test specimens taken from coupons of various cross section.

Allow for Conditions

In making comparisons between different size coupons, the report concluded, location of coupons (cast integrally, gated to cast, or cast separately), or of tests cut from the casting section itself, they should be viewed with the following conditions in mind: (1) Density of the metal under a microscope, as an indication of the efficiency of the risers and the ability of the section to be fed from the risers; (2) effect of mass, particularly upon segregation of certain elements; (3) thermal effects, during heat treatment, particularly where heavy and light sections are involved.

Commenting upon this report, E. W. Campion, president, Bonney-Floyd Co., Columbus, O., stated that acceptance or rejection of coupon tests should not be taken as acceptance or rejection of a casting or lot of castings. Coupon tests, he said, are affected by many factors among which are design, foundry practice, rate of cooling, purity or metal, etc. Several speakers agreed that a grain of sand or small defect in a test bar can make the coupon test completely erratic.

Reporting as the A.F.A. representative on A.S.T.M. committee A-1 on specifications for steel, Mr. Campion commented upon the increasing number of specifications calling for nondestructive testing. This type of testing is in the formulative stage. To keep abreast of the situation, the A.F.A. is co-operating with the Steel Founders Society of America which has just appointed a new technical secretary to study this problem.

With nondestructive testing of steel castings assuming increasing importance in the last few years, practically all of the second steel session was devoted to consideration of the methods used and the attitude of foundrymen toward them. Major Bull presided as chairman. In calling the meeting to order, he paid a tribute to the late George Batty, consultant on steel castings, Drexel Hill, Pa., who at the time of his death recently was a member of the steel division executive committee and the committee on methods of producing steel for castings. By unanimous action, Major Bull was authorized to prepare a suitable resolution to be sent to the widow.

Committee Studies X-ray

Nondestructive testing of steel castings involves radiographic examination either by X-rays or gamma rays and these two methods have been under study during the past year by a committee established a year ago under the chairmanship of C. W. Briggs, physical metallurgist, naval research laboratory, Anacostia, D. C. Mr. Briggs outlined the purposes of this committee and reviewed the progress made thus far. He called attention of foundrymen to the symposium on radiography conducted by the American Society for Testing Materials at 1936 annual meeting, stating that the published proceedings contained much information of importance in connection with inspection of castings.

Mr. Briggs called upon E. J. Ash, associate metallurgist, Watertown arsenal, Watertown, Mass., a member of the A.F.A. radiograph committee, to explain the X-ray and gamma ray methods. Mr. Ash first classified defects found in steel castings as: (1) Those due to shrinkage—metallurgical defects; and (2) those due to founding—these consisting principally as inclusions. He showed a number of radiographs made by the two methods, pointed out the two classes of defects, and exhibited a few castings which had been cut away to show the defects.

R. E. Gezelius, naval research laboratory, Anacostia, D. C., followed Mr. Ash with a brief paper prepared to show the investment which a foundry would be required to make to equip itself for either X-ray or gamma ray inspection. Generally speaking, an X-ray installation capable of inspecting sections from 3½ to 4 inches thick would require an expenditure of about $12,000 and gamma ray apparatus of comparable capacity an expenditure of approximately $7000.

Discussing radiography as a tool in the foundry, L. D. Christy, American Manganese Steel Co., Chicago Heights, Ill., showed a number of lantern slides of defective castings and their X-ray radiographs, then the same castings after redesign and their radiographs recording no defects.

Dealing with radiography as an inspection tool, L. C. Wilson, general manager, Reading Steel Casting Co., Reading, Pa., and a member of the radiography committee, asserted there are many pitfalls in using the radiographic method for acceptance or rejection of castings. These are largely a matter of interpretation of the films. In his opinion, the service to which a casting is to be put must be considered in conjunction with the radiographs. Factual evidence is imperative.

At the conclusion of these surveys of the situation confronting the foundry industry, Major Bull called for comments which would help to determine the attitude which foundrymen should take toward radiographic testing. In expressing his opinion, E. W. Campion, president, Bonney-Floyd Co., Columbus, O., asserted that every manufacturer of castings should acquaint himself with nondestructive testing which is now in its infancy so far as foundrymen are concerned.

Need for Accepted Authority

Needed at present, said Mr. Campion, are the production of good film pictures and some uniform interpretation of these pictures so that there shall be agreement upon what is acceptable for rejection, repair or acceptance of the castings. Foundrymen must be willing to accept someone as an authority on the subject. Furthermore, for the sake of uniformity, in interpretation of radiographs, the examiner must have at his disposal the same type of casting history in all cases. In concluding, he stated that economics will play a part as to what extent radiographic inspection will be demanded by purchasers of castings. Foundries will be obliged to charge higher prices for castings if customers insist on this form of inspection.

P. E. McKinney, metallurgical engineer, Bethlehem Steel Co., Bethlehem, Pa., pointed out that some foundries now are using radiography quietly for their own edification. In many cases, intelligent use of the method has prevented rejection of castings which otherwise would have been condemned, thus the tool can be a help as well as an imposition.

To prove his case, he cited the example of a large turbine casting which developed a leak at some distance from a defect which had been repaired by welding. It was assumed, therefore, that the casting had a porous section; however, radiographic examination proved the section to be sound and the leak was a *whistle* which could be repaired safely by welding.

Mr. Briggs emphasized that in all cases the radiographer should study a casting at the same time he studies its radiograph. Unless this is done, interpretation cannot be accurate and the method cannot be applied in a way to make the most of its possibilities. In closing this portion of the session, Major Bull observed that foundrymen sometimes are accused of being obstructionists to scientific progress, but they may be forced to take this attitude because they are subjected to unfair specification requirements.

Reviews Heat Treatment

Report of the association's committee on heat treatment of steel castings was presented by David Zuege, metallurgist, Sivyer Steel Casting Co., Milwaukee. Reviewing developments for 1936, the committee recorded no important new developments, but referred briefly to the Tocco high-frequency induction process of selective hardening as having possibilities for certain types of steel castings, particularly crankshafts. Note was made of increasing use of differential heating and quenching to obtain varying degrees of hardness in the same casting. Greater use also is being made of differential heating by the oxyacetylene flame. Controlled atmosphere furnaces have not received favorable reception by steel founders, it was stated.

Some 50 members of the steel division attended the luncheon and roundtable discussion Wednesday noon. R. C. Woodward, Bucyrus-Erie Co., South Milwaukee, Wis., and A. H. Jameson, Malleable Iron Fittings Co., Branford, Conn., presided as chairman and vice chairman, respectively. The entire time was spent in presentation and discussion of a summary which C. W. Briggs, physical metallurgist, naval research laboratory, Anacostia, D. C., had prepared of the second report of the steel casting research committee of the British Iron and Steel institute. The report, designated No. 15, was published in 1936.

Certain portions of the report are of considerable interest to American foundrymen and much of the discussion centered around how the British research work agreed with work in this country and how the findings can be applied to the practical side of the steel castings business in American foundries.

Use of portland cement as a binder for molding sand proved a most interesting subject at the third steel session devoted to founding practice. A paper reporting research on utilization of cement was presented by Carl A. Menzel, associate engineer, research laboratory, Portland Cement association, Chicago. John Howe Hall, technical assistant to the president, Taylor Wharton Iron & Steel Co., High Bridge, N. J., served as chairman of the session.

Mr. Menzel stated that cement was known to have been used 40 years ago, but the practice did not become common. Recently, however, interest in its possibilities has been renewed, principally due to development of inexpensive high early strength cements and a new process originating in Europe and recently brought into the United States. The speaker described the nature of the tests made and reported these tests to show the feasibility of using cement. He made the following recommendations as a guide:

"For facing the mold only fresh, clean, well-graded silica foundry sand should be used. The sand should be mixed with about 10 per cent cement and a total of 4½ per cent water by weight of the dry materials. This damp mixture should be rammed in the usual manner and to proper thickness. It can be backed up with a mixture composed of cement and a lower grade of sand or other material.

Describes Cement Facing

"Such a facing mixture, when made with high early strength portland cement and protected from loss of moisture for the first 24 hours, will have excellent strength and permeability for foundry purposes, two or three days after molding, even though dried rapidly following the initial 24-hour moist period. If normal portland cement is used, green strength will be lower and a longer curing period and greater age will be necessary to obtain the same set strength. Increasing the amount of normal cement would give adequate strength, but would bring about an undesirable decrease in permeability and increase the lime constituents at the surface of the mold.

"The facing mixture may be mixed and rammed in the usual manner but extended mulling should be avoided to reduce temperature rise and moisture loss. Mixtures at normal temperature of 70 to 80 degrees Fahr. should be rammed within 2½ hours after mixing if made with high early strength cement, and within 4 hours if made with normal portland cement. Mixtures at higher temperatures, say 100 to 110 degrees Fahr. should be rammed as soon as possible after mixing but not later than one hour."

First to make comment at the conclusion of Mr. Menzel's paper was Marshall Post, vice president and works manager, Birdsboro Foundry & Machine Co., Birdsboro, Pa., who commented upon his company's experience with the Randupson process which makes use of molds made with a cement-sand mixture. Some time after the process was developed in France, the Birdsboro company investigated it and took out a controlling license for its use in the United States.

Mr. Post asserted experience has borne out the expectation that castings produced by the process would be superior to those made in dry sand molds. At present, production in one of the company's plants is almost exclusively by the process. Drying ovens are not needed, consequently three of five units in the plant have been taken out of service.

Comments on Process

C. E. Sims, supervising metallurgist, Battelle Memorial institute, Columbus, O., and formerly associated with the American Steel Foundries, Chicago, had suggested the investigation pursued by Mr. Menzel, therefore, he outlined the history of the work and commented upon the usefulness of the results.

At this point, discussion reverted to the Randupson process and R. E. Aptekar, assistant general superintendent of foundries, American Brake Shoe & Foundry Co., New York, said he had made some tests and found the process to be all that was claimed for it. He stated, however, that more needs to be known concerning the thermal reaction on molds containing cement, particularly as regards moisture.

The matter of floor space was mentioned by two people, for the Randupson process requires increased space for mold storage during the drying period. In one European plant this problem has been solved satisfactorily by providing the required storage space vertically to conserve floor space it was stated. Someone else pointed out floor space is a rather inexpensive item.

Major R. A. Bull, steel foundry consultant, Chicago, said he had observed the process in operation and was impressed by the fine surfaced castings made by it, but he warned that like every process it had limitations and care must be used not to apply it to work for which it is not suited.

Turning back to the subject discussed by Mr. Menzel, C. W. Briggs, physical metallurgist, naval research laboratory, Anacostia, D. C.,

(*Concluded on page* 88)

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(*Concluded from page* 86)
inquired as to why the investigation seemed to aim for high mold strengths. Mr. Menzel replied that his work was not intended to derive high strengths; he was simply reporting the values as they were obtained. He admitted that he didn't know what the strength values should be and he didn't know that anyone knew. In concluding, he stated, the Portland Cement association was not interested in any specific cement mold process, but only in determining the legitimate uses for cement in molding sand mixtures.

Sand control in relation to steel foundry production was discussed in a paper by Charles Fuerst, Falk Corp., Milwaukee. Purpose of this paper was to show in a practical way the value and need of accurate sand control in producing the best possible castings with the materials and equipment available, at the same time keeping an eye on cleaning and material costs.

To obtain fullest results from sand control, the same care that it used in preparing the sand must be used in general molding and core making practice. A sand laboratory may be ever so well equipped and the person in charge ever so conscientious, he said, but if the co-operation which should exist between him and the various department foremen is not there, the whole program will probably amount to just a futile item of expense.

Discussion of this paper centered principally around the use of and effect of water in oil sand core mixtures. Chief function of the water, it was agreed, was to cause swelling of the sand particles.

Sand control has not kept pace with progress in steel castings metallurgy, said Mr. Aptekar in submitting the report of the committee on foundry sands. In this report he outlined work of the committee and asserted that much time and effort is needed to develop procedure and equipment for sand control.

Safety and Hygiene Work Draws Interest

GROWING interest in safety methods and good housekeeping was indicated amply by the attendance at the session on those subjects held Wednesday evening. Approximately 500 members and guests were present to hear five speakers covering various phases of safety and shop cleanliness. President Wick opened the meeting and introduced H. A. Nelson, Wisconsin Industrial commission, who acted as chairman of the session. He pointed out that 95 per cent of the industrial accidents are preventable, and are the result of carelessness of individual workmen. Therefore, it is necessary to select men carefully, educate them in safety and secure their whole-hearted co-operation.

Mr. Nelson called upon M. W. Dundore, Beloit Iron Works, Beloit, Wis., to present his paper on foot and leg protection. He stated that proper protection of the lower extremities when designed to take care of the extreme hazards, gave good results. He also made a plea for more comfortably designed leggings, saying that other protective devices such as goggles, respirators, shoes, etc., had been made fairly comfortable and attractive. Leggings, according to Mr. Dundore, should protect from the knee to the foot, be free from projecting clasps, and not too stiff. He advocated the use of aprons with partial leg attachment for such operations as pouring. Leggings as well as shoes should not be purchased on a price basis. He advocated the use of safety shoes by all employes connected with the shop proper. Best results are obtained by giving a good fit in shoes, and the best method of handling sales was through payroll deductions.

J. Holzbog, Chain Belt Co., Milwaukee, spoke on eye and respiratory protection, and said that 300,000 eye accidents last year resulted in the loss of 3,000,000 man-hours of work in addition to costing several millions of dollars. He stressed the necessity of education and instruction of men on why and how to use goggles and respirators. While there were many types of goggles available he favored the cup type as they could be fitted more closely to the face. However, the choice depended on the particular job where they were required. In the selection of respirators, it is necessary to analyze the problem first and then select the type of respirator. He stated that close attention should be given to the cleaning and maintaining of respirators.

Dr. Norbert Enzer, Milwaukee, presented a paper entitled, "A Consideration of Human Silicosis" in which he advocated the removal of dust as the best means of prevention. He stated that proper selection of men through examination, for work subject to dust exposure, and arrangement for periodic examination at regular intervals is essential. Dr. Enzer said presence of silicosis could not be determined by x-ray examination alone.

Cleanliness Begins With Foremen

Good housekeeping was the subject of a paper by Dr. E. G. Meiter, Employers Mutual Liability Insurance Co., Milwaukee. He pointed out that cleanliness in the shop began with the foremen, and depended upon them for enforcement. One of the first steps in good housekeeping according to Dr. Meiter is to put things in order, and then follow with cleaning up. He also stressed the necessity of removing dust from overhead beams, etc., by water spraying, vacuum cleaning, etc.

James Thomson, Continental Roll & Steel Foundry, East Chicago, Ind., spoke on safety as affected by maintenance. He said that an essential requirement is to establish a strict policy, and then see that it is enforced. He then described various phases of foundry maintenance work, and how safety could be assured when that work was being performed.

Two interesting papers were presented at a session on management which was held Thursday morning under the direction of Dan M. Avey, secretary-treasurer, American Foundrymen's association, Chicago. The first paper by James R. Allan, International Harvester Co., Chicago, was entitled "Industrial Codes and Their Application." Mr. Allan stated that codes relating to industry are just as necessary as legislation, and in general each code may be divided into three phases relating to safety, sanitation and hygiene. He mentioned the work that the safety and hygiene section of the A. F. A. is conducting to make available to the foundry industry a number of basic codes.

He said that in formulating the codes that have been issued, and those to be issued, the members of the section endeavored not only to set up the basic principles, but best practical working practice on the particular phase to be covered. He also said that the codes would be found to be better than existing state codes. Mr. Allan then referred to a new code recently prepared by the section on safety and hygiene relating to exhaust systems. Mr. Allan reviewed it briefly, pointing out its various features, and stated

(*Concluded on page* 92)

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No. 8 Mexican Graphite is an especially prepared, dustless graphite of carefully graded particle size. Its simplicity of use together with its remarkable results, has made it an indispensable item of production in every modern grey iron and malleable foundry. May we supply this super-mettle to your castings?

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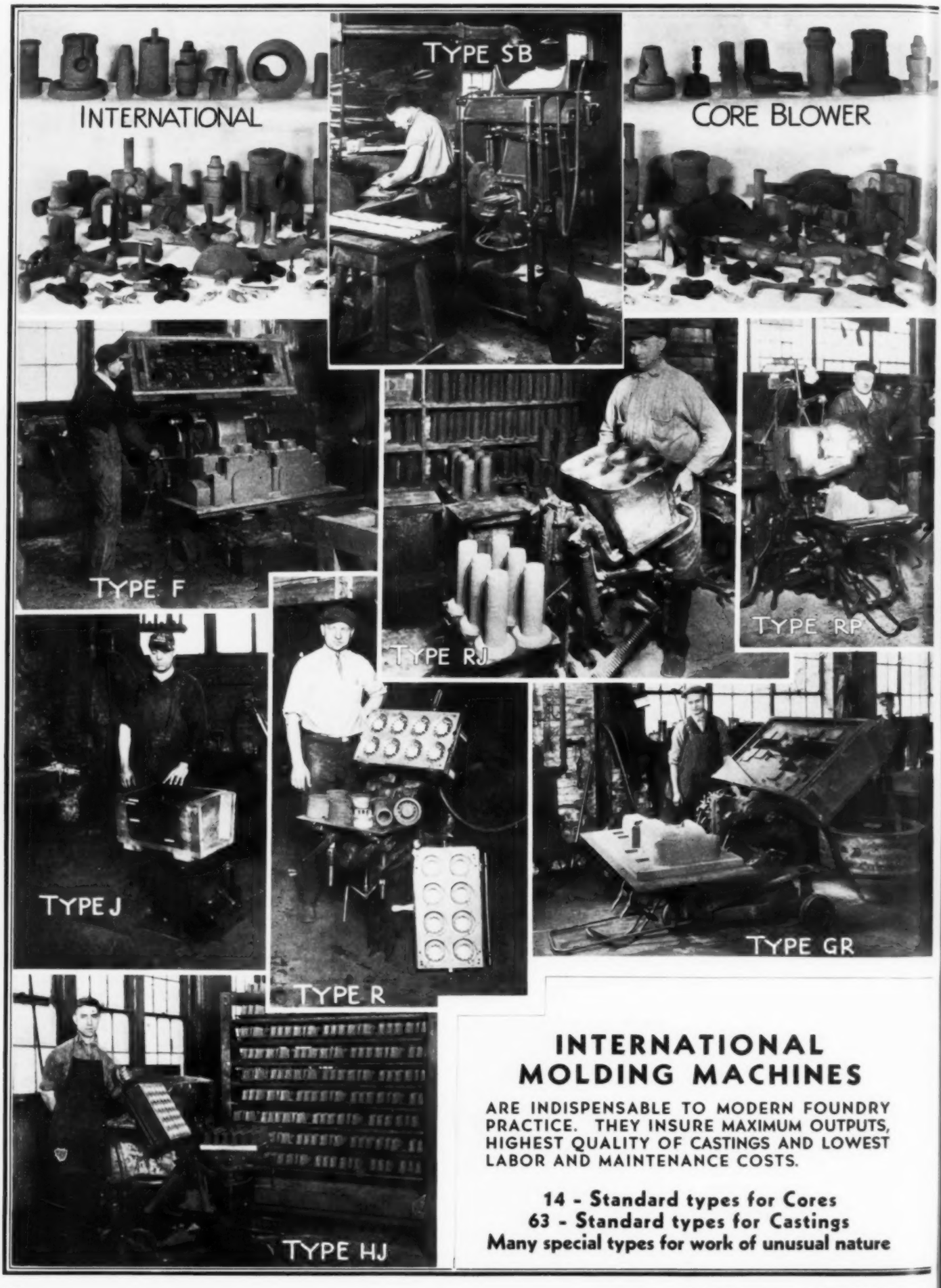

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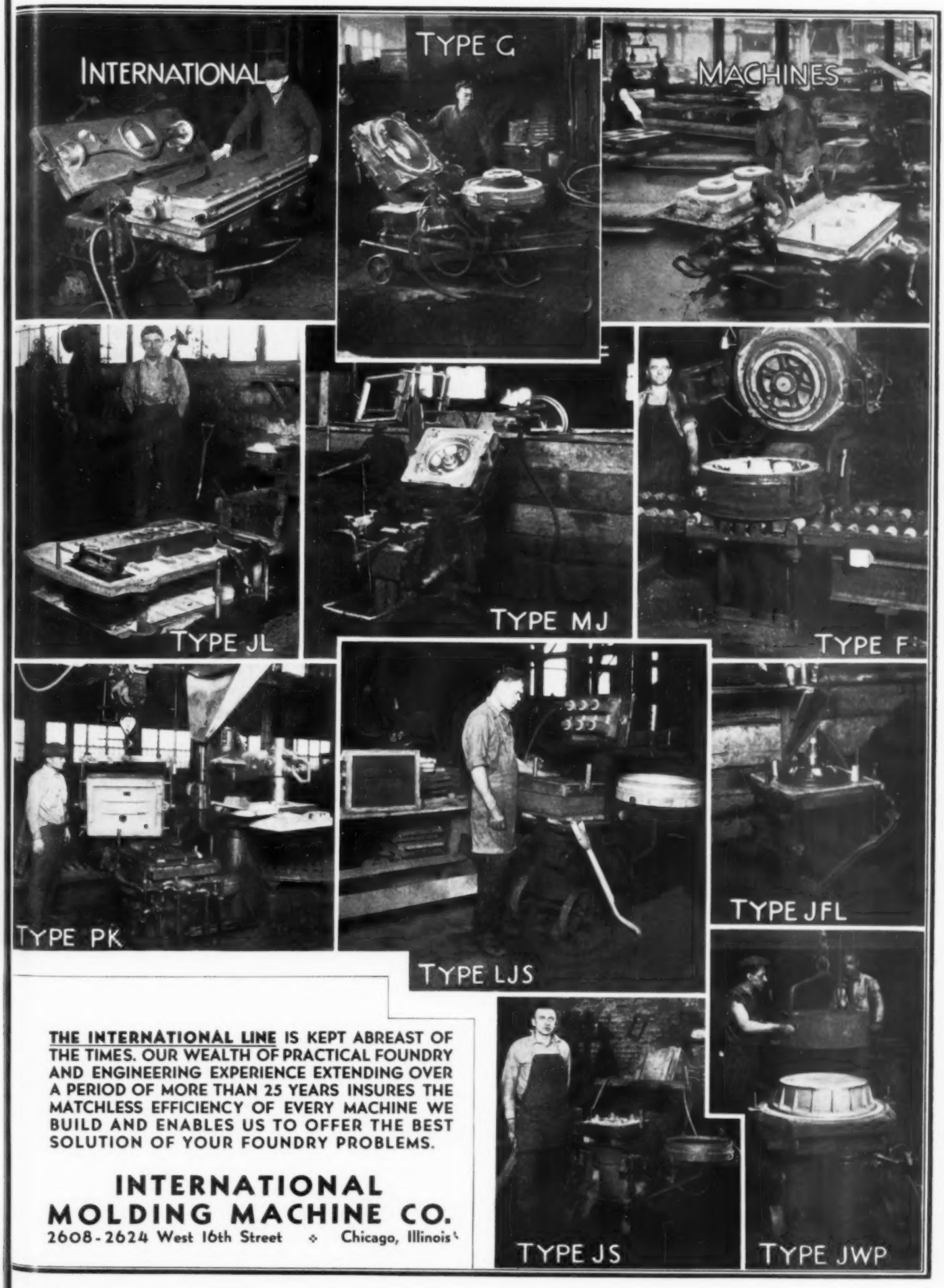

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(*Concluded from Page* 88)

the code will not be available for about two months.

O. E. Mount, American Steel Foundries, Chicago, prepared a paper entitled, "Occupational Disease Laws," which in his absence was presented by O. E. Jones, American Foundrymen's association. The author stated that successful laws relating to occupational diseases must not be built up on existing laws or acts relating to industrial accidents. A separate act is necessary, and it must be just, fair and practicable to both employe and employer. It must be written so that insurability can be assured with a reasonable cost.

Mr. Mount mentioned that in states where occupational disease laws are to be formulated, the drafting committee should be composed of employes, employers, insurers and lawyers familiar with the legal phases involved. A schedule of diseases should not be incorporated, but rather the principles and tests to be met. Ordinary diseases should be eliminated definitely, and all terms should be defined as closely as possible.

Mr. Keatly, Employers Mutual Liability Insurance Co., Milwaukee, in discussing the paper, stated that the type of occupational disease act is not nearly as important as its administration. Since most of the cases to be decided involve medical testimony, the administrators must be capable and educated to distinguish whether or not the testimony is based on scientific information. He also mentioned the advisability of including a rehabilitation phase in the act to care for individuals who, while not having a complete disability, are forced to seek other work due to the fact that further exposure on their present jobs will result later in complete disability. Mr. Keatley also pleaded for a medical program developed on a fair basis to both employe and employer.

R. L. Wensley, secretary, Independent Steel & Iron Producers, New York, spoke briefly on the ferrous scrap situation, especially on the effect that foreign export is having on domestic markets.

Need Scientific Methods Of Rating Jobs

STATING that the variety of problems arising from a mounting tax burden, increases in material costs, and the cost of labor, have brought about the necessity of more scientific methods of rating and pricing jobs, H. S. Washburn, Plainville Casting Co., Plainville, Conn., opened the first session on management and job evaluation. As chairman of the meeting, he introduced Bertram Miller, supervisor, planning and wage department, General Electric Co., Erie, Pa., who presented a talk on "Job Evaluation for Rate Setting."

Mr. Miller defined job evaluation as a procedure designed to establish a wage rate for each job in the foundry. The job and not the individual on that job is being evaluated, he said. Two rates commonly are referred to in connection with job evaluation or wage payment plans, the anticipated day work rate, representative of the average efficiency of a worker, and the anticipated incentive rate, used to establish piece prices or standard cost as a result of detail time analysis.

The speaker was concerned primarily with the establishment of anticipated day work rates, in his discussion. The system set up by the General Electric Co. involves the following steps: Determination of job characteristics affecting job values; development of a list of key jobs; the establishment of a common denominator for each characteristic; relative value of the characteristics; and the development of a value per point to compute rates consistent with company policy.

Skill, mental and physical application, responsibility and working conditions are the four characteristics of a job according to the speaker. He used the die maker, craneman, sandblast operator and sweeper as representative to illustrate the method used in preparing a key list for each of the previously mentioned characteristics. The point system of measurement was described, by which the various characteristics are measured and weighed, each point possessing the same value whether it be applied to a sweeper or highly skilled operator. According to Mr. Miller, points assigned represent the respective value of each characteristic over the base value which has been set at 400 points.

Employe's advantages derived from this system were given by the speaker as: Establishment of a fair anticipated earned rate; full recognition to skilled work; and an absolutely fair rate structure. Employer's advantages are: A requirement that payment be made for what the job is worth for the specific operation; elimination of labor trouble; and a direct means of comparing jobs of like requirements.

"Time-Motion Study and Job Standardization" was the subject interestingly presented by H. C. Robson operating superintendent, Link-Belt Co., Chicago, as the second part of the program. Mr. Robson outlined briefly the development of modern business and growth of industry through the years, as an introduction to his talk. The first requirement of production is a scientific investigation of needs and methods calculated to restore the centralization of knowledge, he said.

A Study of Habits

With that as a premise to work from, the speaker went directly to a discussion of scientific management and job standardization. Time and motion study, in the opinion of Mr. Robson, is a study of habits and a determination by careful analysis of what the best habits would be for performing a given task. Results of standardization are increased production and better labor relations. The foreman's approximate estimate as against the accuracy of a system was pointed out emphatically during the speaker's talk. Mr. Robson devoted considerable time to the varied phases of job standardization, including wage payments, use of charts and graphs, analysis, cooperation between time study man and workmen, etc. Some applications of the system at the Link-Belt Co. were presented and analyzed, showing graphs used for time allowances and classifications as to types of work. Mr. Robson completed his talk by showing motion pictures of the company's equipment and operation, time taken for work, steps taken in various jobs, etc., before and after the application of an efficient, time saving and cost reducing job standardization, time-motion study.

Valuable points of further interest to those attending the meeting were brought out by the general discussion following the talks. Albert J. Messmer, Messmer Brass Co., St. Louis, asked Mr. Robson how many men could work on the Link-Belt Co. efficiency unit, the point being brought out that it could be set up for as many men as desired. William J. Grede, Liberty Foundry Inc., Milwaukee, prompted consideration of repeat molds and their connection with the job system. F. C. Nus, John Deere Tractor Co., Waterloo,

(*Concluded on page* 94)

Enthusiasm CERTAINLY RAN HIGH

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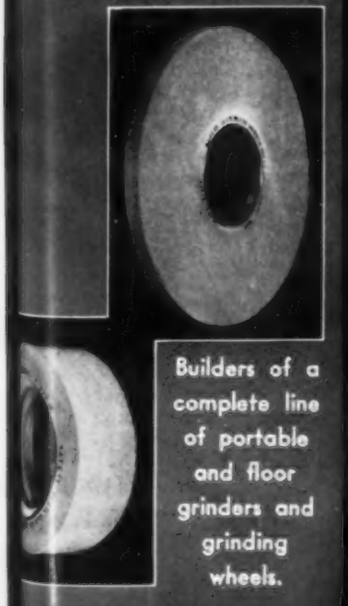

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(*Conclulel from page* 92)
Iowa, and John Thwaites, Beatty Bros. Iron Co., Ontario, Canada, discussed the use of committees for evaluating jobs. Compensation for the length of time a job runs was discussed by A. E. Hageboeck, Frank Foundries Co., Moline, Ill., and Augustus Kelly, R. Hoe & Co., Dunellen, N. J., asked about the application of standardization system with reference to a first class skilled molder as against a first class patternmaker. T. S. Quinn, Lebanon Steel Foundry, Lebanon, Pa., William C. Atwater, Lennox Furnace Co., Marshalltown, Iowa, and Mr. Washburn also made suggestions and gave their reaction to the use of an evaluation and standardization system.

Foundry Industry Must Train Apprentices

AS A vital concern to both small and large foundries throughout the country, apprenticeship training programs, necessitated by a shortage of skilled labor caused by depression curtailment, received comprehensive treatment at the session held Wednesday morning. John H. Ploehn, French & Hecht Inc., Davenport, Iowa, chairman of the meeting, urged a return to educational systems based on the fundamentals rather than the arts, music, and a more literary training. School boards should be more concerned with vocational training, he stated, and attempt to teach a returning respect for trades in general.

Winners in Contest

Victor Hydar, Falk Corp., Milwaukee, announced the following winners in national apprentice contests: Patternmaking, Fred Henz, Western Pattern Works, Cleveland, first place; Alex Allardyce, Alter road, Detroit, second; and George Sharrar, French & Hecht, third; Gray iron molding, Fred Osterman, International Harvester Co., Rock Island, Ill., first; John Waddington, Brown & Sharpe Mfg. Co., Providence, R. I., second; and Albert Lamp, Blackhawk Foundry & Machine Co., Davenport, third; Steel molding, Stanley Raskiewicz, Sivyer Steel Casting Co., Milwaukee, first; Kazimir Paliwoda, Cleveland Trade school, Cleveland, second; and John Kelly, Maynard Steel Casting Co., Milwaukee, third; Nonferrous molding, John Elka, Allis-Chalmers Mfg. Co., Milwaukee, first; Casimir Kotowicz, Ampco Metal Corp., Milwaukee, second; and Mike Kost, Cleveland Trade school, third.

The three necessities for successful application of an apprentice system, an objective, careful planning and hard work, were the basis for the presentation by Macon P. Miller, Lynchburg Foundry Co., Lynchburg, Va., in his discussion of the program in use at that company. The apprentice is given complete departmental experience in as many parts of the shop as possible, according to the speaker. Classwork, rates of pay, molding shop procedure, the job sheet and general aspects of the shop plan being operated at the present time by Mr. Miller, were explained briefly.

W. E. Watson, Allis-Chalmers Mfg. Co., Milwaukee, introduced Byron Whittfoht, Caterpillar Tractor Co., Peoria, Ill., who substituted for K. P. Crowell of that company, who was unable to attend. Mr. Whittfoht described the plan in use at that plant and remarked that the first consideration in an apprentice plan is the motive behind it. He stated that the boy should be prepared as fully as possible, equipment should be analyzed, the necessary literature acquired to teach him and the terms of his agreement should be made clear. Orderliness, age and continual contact with the graduate as well as the primary apprentice are important points, he said.

Graduate Presents Views

W. C. Van Cleaf, Allis-Chalmers Mfg. Co., introduced Carl F. Haertel, Falk Corp., who rounded out the formal program by giving his impressions of apprentice training as viewed by a graduate. He referred to earlier methods as compared with present day scientific comprehensive programs. The speaker placed emphasis on broadening the apprentice's field of work and explanation of the opportunity offered in trades.

In the general discussion following the main talks, Frank Cech, Cleveland Trade school, asked Mr. Ploehn for further explanation of his ideas on grammar school education. C. J. Freund, University of Detroit, Detroit, and J. G. Goldie, Cleveland Trade school, substantiated Mr. Ploehn's statements by referring to the fact that hundreds of young men seem willing to half starve in a white collar job while many jobs are available in numerous vocations. W. E. George, American Steel Foundries, Chicago, stated that the picture of education has changed in the last 15 or 20 years, to the extent that apprentices are demanding logically more from the company for which they work. George E. Larsen, Spanish Fork Foundry Co., Spanish Fork, Utah, emphasized the desirability of a high school education as a definite aid to any apprentice system.

Industry must strive for an answer to foreman training programs progressively and without bias and makes its policies effective and fair, according to a statement made by A. D. Lynch, J. I. Case Co., Racine, Wis., as his introductory approach to an interesting discussion on Thursday. Presented to the group by Victor J. Hydar, Falk Corp., Milwaukee, chairman of the meeting, Mr. Lynch stated that foreman training is no longer an innovation. The largest problem is to adopt the best training method for the average foundry, he said.

Foremen Come from Ranks

Management has recognized the need of better foremen, according to the speaker, and the foremen in turn have recognized the necessity for better equipment. The majority of foremen foundries propose to train should and do come from the ranks. Management must train foremen broadly, give them a comprehensive education in as many phases as possible, he said. The two jobs required of foremen are to get out the product and handle people. Six essentials of a good foreman are intelligent supervision, maintenance of schedule, condition of plant and equipment, orderliness and cleanliness, safety and economy.

Mr. Lynch believes production is not possible without people and confidence must be restored in management and supervisory authorities. Foremen should have their responsibilities delegated correctly, their compensation distributed fairly and their faith in management secured. A foreman, according to Mr. Lynch, must know his men and manage them according to their temperament, set a proper example and adjust rates properly.

Essentials of a good foreman training program outlined by the speaker included selection of the group, time and place of meeting and leadership. W. E. George, American Steel Foundries, Chicago, spoke in the general discussion following the talk about selection of foremen and diversity of requirements, believing skill is not as essential as a comprehensive knowledge of many things. Other dis-

(*Concluded on page* 98)

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(*Concluded from page 94*)
cussion brought out the difficult problem caused by the fact that employed forces today are generally more educated than the foremen.

Mr. Hydar introduced S. M. Brah, International Correspondence Schools, Chicago, who presented Stewart Scrimshaw, Marquette university, Milwaukee. Mr. Scrimshaw interpreted the labor situation in the light of apprentice training. He stated that labor has been organizing, but apprentice training programs have not organized soon enough. He urged that foundries build around the youth of the country. The speaker then brought up the question of the Wagner labor act and its effect on apprenticeship, stating that unions are going to be interested in the training programs.

The welfare of society is the most important consideration in determining the number of apprentices to be trained, according to H. A. Frommelt, Marquette university, in his talk at the meeting. He asked Dean C. J. Freund, University of Detroit, to outline the formula he evolved for this problem. Mr. Scrimshaw discussed wage payments and payment of bonuses in particular to apprentices. Trends in the evolution of apprentice training programs were outlined by Mr. Frommelt. John Grennan, University of Michigan, added the economics of the political evolution as a trend, and Mr. Frommelt concluded formal discussion by relating the extent apprenticeship will contribute to future foremen.

Discuss Metallurgy of Gray Cast Iron

CONSIDERABLE interest was displayed at the first session on gray cast iron on Tuesday morning. Approximately 250 members and guests attended the meeting which was under the direction of Hyman Bornstein, Deere & Co., Moline, Ill., chairman, and W. H. Spencer, Sealed Power Corp., Muskegon, Mich., vice chairman. The first paper on the occurrence and control of ferrite, prepared by R. H. Bancroft, Perfect Circle Co., Newcastle, Ind., and A. H. Dierker, Ohio State university, Columbus, O., was presented by Mr. Dierker. According to the authors, any given iron has a definite range of cooling rates within which a normal pearlitic structure will result, but higher or lower cooling rates will form different types of ferrite.

In the discussion Paul S. Lane, American Hammered Piston Ring division, Koppers Co., Baltimore, Md., stated that the phenomenon mentioned was known under a variety of names such as eutectic graphite, etc., and that Norbury and Morgan in England had been able to make it appear and disappear at will by gassing molten cast iron with carbon dioxide. M. F. Surls, Clark Tructractor Co., Buchanan, Mich., and Frederick G. Sefing, International Nickel Co., Bayonne, N. J., said that in their opinion, the furnace temperature during melting has an important effect on the final structure, and that iron with a total carbon of 3 per cent or under, melted at 2900 degrees Fahr., would give primary ferrite.

Mr. Spencer mentioned that primary graphite formation was attributed to several causes, but that progress in its elimination was being made by control in slag and in melting conditions. Garnet Phillips, International Harvester Co., Chicago, stated that similar trouble in small gears was overcome by the addition of 0.35 per cent chromium. Others discussing the paper included J. S. Vanick, International Nickel Co., New York, A. S. Lorig, Battelle Memorial institute, Columbus, O., and R. F. Herzog, Climax Molybdenum Co., Detroit.

The second paper presented was by J. A. Bowers and J. T. MacKenzie, both of the American Cast Iron Pipe Co., Birmingham, Ala., and was on the effect of coke size on cast iron melted in the cupola. The cupola employed was 21 inches in inside diameter, and the coke ranged in size from 1 to 4 inches. It was found that sulphur and carbon increase and silicon and manganese decrease with each decrease in coke size, and that after the first 8 to 10 ladles changes in the elements are practically unaffected by change in coke size.

R. F. Watson, in discussing the paper, mentioned that in blast furnace practice an increase of 10 per cent in capacity and from 2700 to 2800 degrees in pouring temperature was noted by using sized coke. R. H. Bancroft asked if there was a possibility of setting up a schedule of coke sizes by mathematical analysis. J. T. MacKenzie replied that three variables involved made it a practical impossibility. Mr. Lyon, Wheeling Iron & Steel Co., Wheeling, W. Va., said that his firm found it necessary to supply sized coke to meet requirements of various sized cupolas, particularly those of small diameter. P. T. Bancroft, Moline, Ill., stressed the necessity of using uniform coke sizes in the cupola if the best results are desired.

The final paper on the program was by H. H. Judson, Goulds Pumps Inc., Seneca Falls, N. Y., on founding of pressure castings. He discussed the two-cupola process used in his plant to produce a high test cast iron. The iron freezes at 2400 degrees Fahr., and it must be poured hot. Also large risers must be used for feeding. In the discussion John Grennan, University of Michigan, Ann Arbor, Mich., asked about arbitration test bars to which Mr. Judson replied that they were not used. Tests are performed on sections taken from castings broken under pressure testing to destruction. A. L. Daoust, Sterling Foundry Co., Wellington, O., asked if trouble from dendritic structures were encountered with the type of iron used. Mr. Judson said that such occurrence did not cause trouble in his castings. R. S. MacPherran, Allis-Chalmers Mfg. Co., West Allis, Wis., said that high test cast iron had a tendency to develop dendritic structures.

Committee Report on Tests

The meeting was closed wih the presentation of a report from the committee on fluidity testing by Chairman Spencer who pointed out the numerous variables encountered in such an investigation, and that little was known about some of them. He stated that the spiral test bar as improved by Saeger and Krynitsky gave concordant results, and should prove a useful tool in the foundry.

A luncheon meeting of the gray iron division was held Tuesday noon which was attended by approximately 300. J. T. MacKenzie, as chairman, spoke of activities of the division. He called attention to the recently formed committee for coordination with engineering school instructors, and requested all members of the division to co-operate as much as possible. Hyman Bornstein, past chairman of the division, and president elect of the A. F. A., urged strenuous efforts to build up membership in the division and in the A. F. A.

Following that meeting the second technical session on gray iron was held with J. T. MacKenzie, and

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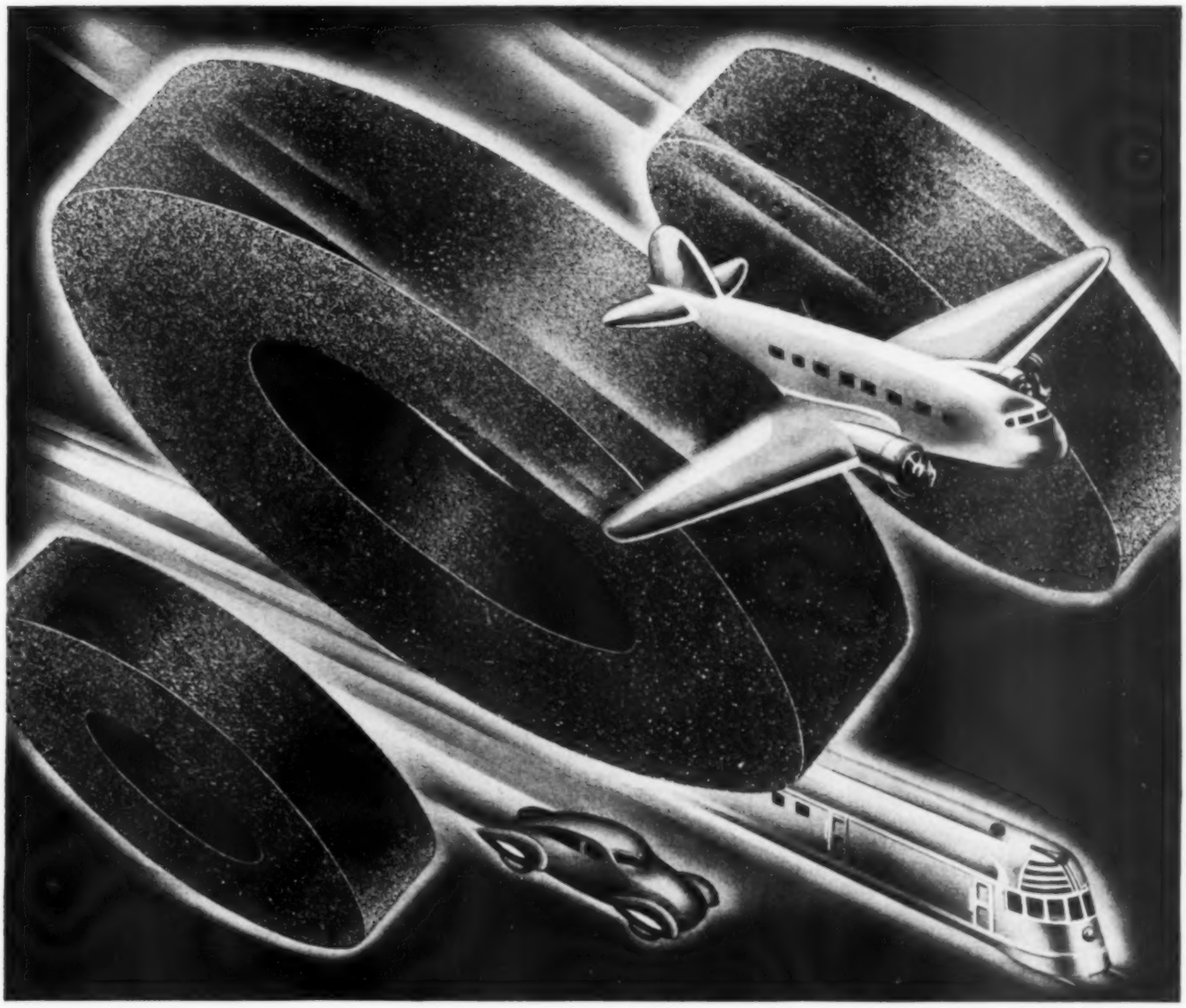

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STERLING ABRASIVES

(*Continued from page* 98)

Garnet Phillips, International Harvester Co., Chicago, acting as chairman and vice chairman, respectively. The first paper on cast iron for nitriding by J. E. Hurst, Staffordshire, England, presented by Hyman Bornstein, and discussed analyses, hardening and stabilizing treatments, nitriding procedure, etc. Further sections take up heat treatment, hardened surface, chemical composition, microstructure, mechanical properties and application. R. F. Harrington, Hunt-Spiller Mfg. Co., South Boston, Mass., stated that his firm has made iron for nitriding, and that the castings must be poured with the minimum disturbance in the mold. Also care must be taken to see that the mold is clean. Hot spots at the gate must be avoided to prevent any shrinkage or porosity. Garnet Phillips called attention to Mr. Hurst's results with hardened and tempered cylinder liners, and said that they did not agree with those obtained in this country. In his paper Mr. Hurst stated that there was little difference in wear results between plain cast iron, alloy cast iron in the "as cast," and in the hardened and tempered condition.

D. W. Murphy and W. P. Wood, both from the University of Michigan, Ann Arbor, Mich., prepared a paper on "The Hardenability of Cast Iron" which was presented by Mr. Murphy. The authors gave data on five heats of iron to illustrate the use of aluminum additions to confer shallow hardening properties. The most pronounced decrease in hardenability in the base mixture studied appears to be from 0.02 to 0.03 per cent.

Paper on High Test Iron

R. S. MacPherran presented a paper on cupola high test cast iron in which he described the procedure employed in his plant. The cupola charge is composed of 80 per cent steel scrap, 8 to 10 per cent return scrap, 8 per cent silvery pig, 1 to 2 per cent pig iron (2 to 3 per cent silicon), and 2 per cent ferrosilicon. In the spout 3 pounds of ferromanganese-silicon is added for each 1000 pounds of metal in the ladle.

He pointed out that to obtain low carbon content, the metal must not be permitted to remain in the cupola long. Due to greater shrinkage the risers used are larger than usual, and short gates must be used because the metal has a short freezing range. Also the iron must be poured hot to obtain the greatest physical properties.

In a written discussion Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., stated that test bars in which the surface had been ground show a considerable improvement in strength. E. F. Green, Axelson Mfg. Co., asked about the bed height employed, and innoculation in the ladle. Mr. MacPherran said that the bed was approximately 35 to 38 inches above the tops of the tuyeres, and recently had been reduced from 2300 to 2100 pounds in weight. He also said that graphitization of the iron was performed both in the cupola and in the ladle through the addition of the ferromanganese-silicon.

H. H. Judson asked about tapping, and the reply was that short taps were employed to keep the cupola well as dry as possible to prevent carbon pick-up. Others discussing the paper included Elmer J. Carmody, National Superior Co., Springfield, O.; Gottfrid Olson, National Founders association, Chicago, and J. A. Bowers.

The Wednesday session on gray cast iron, with S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago, and Fred J. Walls, International Nickel Co., New York, serving as chairmen, attracted an audience of 150.

Make Transverse Test Bars

A method for making transverse-strength test bars in green-sand molds was detailed by C. M. Saeger Jr., United States bureau of standards, Washington. He emphasized the importance of providing freedom from burned-on sand and other surface defects in preparing test bars. Sand mixture employed consisted of eight parts molding sand to one part of seacoal, with 7 per cent moisture. Four methods of molding were employed: bottom poured vertical mold, top-poured vertical mold, horizontal mold and horizontally inclined mold. Transverse breaking strength of the irons investigated increased with an increase of the maximum heating temperature, regardess of the casting method employed.

No essential difference in the primary structure or in the microstructure of test bars of the sand composition and size, but cast by different methods were revealed. A finer primary structure, and finer graphite and pearlite constituents, were found to be associated with higher transverse strength.

Considerable interest was shown in a discussion of wear testing by Paul S. Lane, American Hammered Piston Ring Co., Baltimore. The procedure followed in these tests consisted of the application of specimens, ½-inch square, to drums affixed to a motor shaft, wear being determined by weight loss of the specimen. Results indicated that in actual service, finish is an important factor. Coarse, or moderate-grained iron seemed more resistant to wear than those of fine-grained structure. Phosphorus appeared to aid in resisting wear, while high sulphur also seemed advantageous. Best wear was found to result with carbon contents of 3.40 and under.

Coarse pearlite usually indicates improved wear resistance over the sorbitic type, it was stated. Alloy additions improve wear, often to a marked degree, but if grain refinement is carried too far, the opposite result may obtain. High pouring temperature, resulting in very fine grain, may result in impaired wearing qualities.

A comprehensive paper entitled "Influence of Composition and Section Size on the Strength-Hardness Ratio in Cast Iron" was presented by A. L. Boegehold, General Motors Corp., Detroit. The author pointed out that the relationship between strength and hardness in cast iron is determined by the amount and distribution of the various microstructural constituents. These latter factors in turn are governed by the chemical composition of the iron and the rate and nature of solidification. The latter are affected by the rate of heat dissipation and presence of modifying materials which act as nuclei for the beginning of solidification.

Effect of Alloys

The nature of these nuclei determine their frequency, therefore the number of centers from which freezing is initiated, and thus the overall time for solidification.

Microstructure and physical properties of alloy cast irons were discussed by V. A. Crosby, Climax Molybdenum Co., Detroit. Alloys were discussed from the standpoint of their effects on cast iron, being divided into the group which increases combined carbon and free cementite and those alloys which tend to reduce the amount of the common hardening constituents, cementite and pearlite. Carbide forming elements touched on included vanadium, chromium, molybdenum and manganese. The second group included graphitic carbon, silicon, titanium, nickel and copper.

At the concluding session Friday, three papers on various phases of cast iron were presented under the chairmanship of J. W. Bolton, Lunkenheimer Co., Cincinnati, with H. H. Judson, Goulds Pumps, Inc., Seneca Falls, N. Y., serving as vice chairman. The first paper described the effect of titanium additions to cast iron and was presented by E. R. Starkweather, Titanium Alloy Mfg. Co., Niagara Falls, N. Y. Following a brief historical reference and an enumeration of the physical properties of the metal, the speaker

(*Concluded on page* 104)

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(*Concluded from page* 100)

quoted from the published works of Moldenke, Piwowarski and Stoughton to show that titanium has a beneficient effect on the physical properties of gray cast iron. He stated that the metal is a powerful deoxidizer and also promotes graphitization. In cupola practice the required amount of titanium is added to the stream as it flows into the ladle. In another form the metal is available and recommended for use in the electric furnace. The speaker presented a number of slides showing the difference in fractured test bars between treated and untreated metal. Running comment on the various slides covered a comparison between the physical properties.

British Exchange Paper

"Some Steel Works Castings", the annual exchange paper of the Institute of British Foundrymen, prepared by J. Roxburgh, Davy Bros. Ltd., Sheffield, England, was presented in abstract by J. W. Clyer, Allis-Chalmers Mfg. Co., Milwaukee. Since the latter company has been engaged in the manufacture of heavy castings for many years, the speaker was in position to comment on certain points of difference between British and American foundry practice. The paper carried detailed explanation of the various problems encountered in the production of large castings, ingot molds, anvil blocks and cylinders, etc., used in steel works operation. In discussing ingot molds the author stressed the point that the quality of these castings is measured by the life or in other words the number of castings produced in them before they are scrapped. Composition text and illustrations covered the molding of a 60-ton ingot mold. The mold and core were made in loam with skeleton patterns and sweeps. The metal mixture for large molds is made up of 25 per cent hematite scrap, 30 per cent pig iron, 2.50 to 2.75 per cent silicon and 0.50 per cent manganese, and 45 per cent pig iron 1.00 to 1.25 per cent silicon and 1.00 per cent manganese. Analysis of the casting shows: 3.60 per cent total carbon, 1.60 to 1.80 per cent silicon, 0.50 to 0.70 per cent manganese, 0.07 per cent sulphur, maximum, and 0.07 per cent phosphorus, maximum.

Summarizing an extensive paper of 68 pages on graphitization and inclusions in gray iron, John W. Bolton, Lunkenheimer Co., Cincinnati, O., stated that one who has studied the literature of this subject would be rash indeed to come to any sweeping conclusions about the underlying reasons for the effects produced by superheating, the matter of heredity in cast irons and other apparent anomalies. For convenience cast iron may be described as a eutectiferous series of alloys of iron, carbon, and silicon, containing as cast, combined carbon not in excess of the eutectoid percentage, the matrix containing many graphite flakes. However, it is a series of alloys. Other constituents beside carbon and silicon must be considered. Manganese, phosphorus and sulphur, also alloys like nickel are determined in routine analyses. The chemistry of minor constituents is important.

Useful mechanical properties depend mostly upon the nature and continuity of the matrix. Continuity of the matrix depends upon the amount, size and distribution of graphite flakes. Foundrymen are fairly familiar with some aspects of graphitization, but very much remains to be established firmly. For example the graphite nuclei hypothesis of Piwowarski, Hanemann and co-workers. These are of doubtful validity for decidedly hypoeutectic irons and in their original form for cast irons in general. Silicate slime hypothesis of Van Kiel and associates is attractive in many respects, but not proved directly. Formation of fluid inclusions or inclusions with fluid peripheries, making the inclusions ineffective as nuclei is postulated by Norbury and associates.

Under certain conditions some of the premises of these hypotheses may be valid. The author appreciates the value of the work on inclusions proper, and recognizes the difficulties which confront investigators in that field. Nuclei action or inclusions probably is not the sole explanation for the phenomenon of variation in graphitization.

Shop Course Features Practice Problems

MANY interesting features encountered in cupola operation were described by Don J. Reese, International Nickel Co., Bayonne, N. J., at the first session of the shop operation course presided over by P. T. Bancroft, Moline, Ill. Through illustrations on the screen he outlined the salient items of construction and the function of each, either singly or on combination with the others in securing satisfactory metal. The cupola is a rapid, economical medium for the production of molten iron, but the character of the product and the cost of operation may vary widely according to the manner in which the technique is applied.

Touching on the subject of blast volume and pressure, the speaker stated that satisfactory melting may be accomplished with either a single or double set of tuyeres. However, he qualified that statement to the extent that more care and skill are required in operating a cupola equipped with only a single set of tuyeres. Also in this connection he pointed out that with a given set of conditions the melting speed is increased by the substitution of hot for cold blast.

He also stated that no definite rule can be laid down for the proper height of bed that will apply to all cupolas. Conceivably a bed 24 inches in height might serve with a mild blast and for the production of a certain class of castings. At the opposite extreme a bed 60 inches in height may be required to produce satisfactory results.

J. A. Bowers, American Cast Iron Pipe Co., Birmingham, Ala., described a series of experiments carried out to determine the height of the tuyeres and the space required in a cupola to hold a maximum amount of iron between taps.

It was found that only 37 per cent of the calculated basin capacity was available for molten iron. On a second test this capacity was found to be 35 per cent.

Advantages of natural and synthetic molding sands and various factors which must be taken into consideration in making a choice between were described by H. A. Deane, Deere & Co., Moline, Ill., at the second session in the shop course presided over by R. K. Akin, Chicago Malleable Castings Co., Chicago. From the character of inquiries from the floor and the representative number of men in attendance it is apparent that the subject is one of perennial interest.

In explaining that synthetic sand, that is sand formerly discarded as of no further use, but now rebonded and conditioned, the speaker claimed that the idea really is not new, since the practice always has been common of preparing a synthic sand for facing. Touching on the subject of preparing heaps of synthetic sand Mr. Deane stated instead of adding a bonding agent directly to the heap, it is better to

(*Concluded on page* 106)

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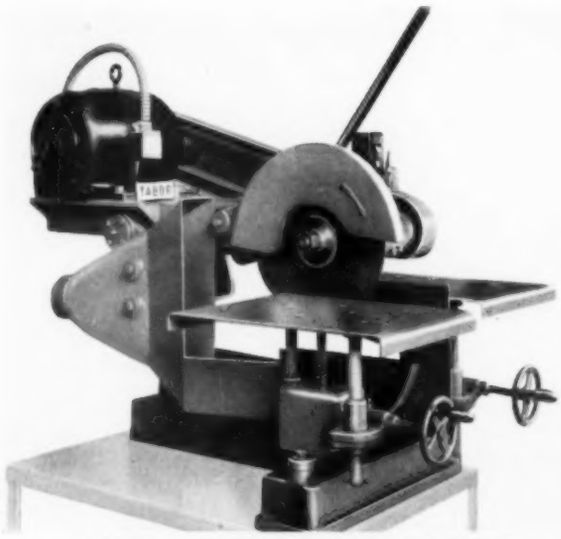

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prepare a small quantity of sand in somewhat concentrated form, and then cut this material into the heap. The special sand is mixed while in a dry state to remove the required percentage of fines and then graded through screens. Although not used as extensively as molding sand, a considerable quantity of core sand now is prepared with varying percentages of old core sand. The core butts and lumps first are crushed, then screened and graded before the reclaimed material is added to the mixtures.

Generally speaking, a closer check must be kept on synthetic sand, than on naturally bonded sand. H. M. Lane, Detroit, referring to some early experimental work on sand reclamation, pointed out that the condition of the clay binder was an important factor. Maximum results only are attained when the clay is in a fine colloidal condition. In one instance a clay quite unsatisfactory when added in the raw state, was rendered satisfactory by first mixing the clay with water, agitating the mixture violently and then allowing the mixture to settle. The fine clay remaining in suspension was used to bond the sand.

Consider Cupola Operation

Evidencing keen interest in the controversial subject of shop operation and, more particularly, cupola operation and carbon control, a capacity group gathered in the Schroeder hotel Tuesday afternoon. K. H. Priestley, Eaton-Erb Foundry Co., Vassar, Mich., was chairman of the meeting and Fred J. Walls, International Nickel Co., New York, was discussion leader. Mr. Walls specified the subject as being more closely allied in reality to cupola operation as it affects carbon control of cupola iron. He referred to the morning discussions on coke size and stated that the reasons for controlling carbon are to acquire a specified carbon and to maintain it throughout a heat. The reactivity of coke was given consideration by the speaker.

Such conditions as high and low beds, high and low blasts, degree of oxidation, design of cupola, volume of metal charge or mixture and size of materials were given as important and varied factors contributing to the control of carbon. High and low range carbons are equally hard to control, according to the speaker.

Mr. Walls invited comment on his remarks and received numerous suggestions, ideas and case examples of individual experiences from the assembled group. John Grennan, University of Michigan, Ann Arbor, Mich., referred to carbon pickup, the factors causing it and remarked that a lower carbon will be achieved with a lower coke ratio. Atmosphere, melting zone and coke were given as three contributing elements to the job of controlling carbon. P. T. Bancroft, Moline, Ill., stated that variations in carbon are due in part to variations in coke size and the height of the coke bed.

Mr. Walls stated that experience had shown carbon drops to a certain extent with the accompaniment of high humidity. A spirited discussion by numerous men in attendance, on experiences in their own shops, theories and various phases of shop operation practice, concluded the meeting.

At the fourth session of the shop operation course, with E. J. Carmody, National Superior Co., Springfield, O., as chairman, and H. L. Campbell, American Hoist & Derrick Co., St. Paul, as discussion leader, the subject of coremaking was discussed from many angles, particularly the sand combinations and the drying or baking technique.

In outlining the subject Mr. Campbell directed attention to the materials used in cores, classified under three heads: Sands, binders, solvents. The first also includes silica flour sometimes employed in combination with sand to increase the refractories and to impart a smoother skin to the casting. Mineral binders include fire clay and bentonite. Organic binders include oils, water soluble substances, pitch, rosin, and cereal binders. Sugar is the active agent in some and starch or dextrine in others of the water soluble group.

Oil is dried by oxidation. Water soluble binders are dried by evaporation. While pitch and rosin first are melted and then dried by cooling. From the foregoing it is apparent that the coremaking technique must be altered to some extent and adapted to the mixture containing any given type of binder. For example heat alone is not sufficient for drying cores bonded with oil. Air also must be supplied to promote oxidation. The temperature of the oven may vary between 350 and 450 degrees Fahr. In the water soluble and cereal binders the water commences to evaporate at 212 degrees Fahr. In practice it has been found that a temperature of 350 degrees Fahr. gives the best results. The same temperature also has been found to provide the best results for pitch and rosin bonded cores.

A REPORT of the interesting sessions on nonferrous practice and malleable cast iron held during the convention week in Milwaukee, and the reports on the sessions on refractories, foundry costs, and on sand will be presented in the June issue of The Foundry.

Touching on another phase of the subject the speaker stated that oil sand cores lose 36 per cent in strength if left in a green sand mold for 4 hours. Under the same conditions cereal bonded cores lose 30 per cent, while cores bonded with molasses may lose 100 per cent.

The fifth and concluding shop course session, devoted to the subject of gates and risers, was presided over by Leslie G. Korte, Atlas Foundry Co., Detroit, with discussion led by Rex Jennings, Deere & Co., Waterloo, Iowa. Gaged by the attendance, interest in the series of shop course lectures is as great as when this feature was inaugurated several years ago.

Gating Presents Problem

To the uninitiated or to those with experience limited to the production of one or two lines of castings, the problem of gating might appear comparatively simple. In fact, the speaker claimed that in many instances no problem is involved. Any size opening placed anywhere in the vicinity of the mold cavity will conduct the metal into the mold in a perfectly satisfactory manner. However, in a great many other instances, the shape, size and position of the gate are features of prime interest.

In this connection also it is interesting to note that no blanket rule can be laid down for the best type of gate that will serve under any and all circumstances. The speaker referred to the book *Gates and Risers for Castings*, by Pat Dwyer, in which the author of that volume showed a list of 32 types of gates. Evidently with this variety for a base, an almost endless number of combinations, or modifications may be worked out.

Sand conditions are not identical in every foundry and for that reason a type of gate perfectly satisfactory for a given casting in one foundry may have to be changed or modified to some extent to serve satisfactorily in another foundry.

Illustrating his remarks the speaker showed a number of slides and directed attention to the manner in which the gating system was employed to secure clean, solid castings.

Bureau of Mines, Washington, has published the annual report of its metallurgical division for the fiscal year of 1936. The report by R. S. Dean contains 49 mimeographed, 8½ x 11-inch pages, and describes the work accomplished and results obtained in the various fields of investigation such as copper metallurgy; iron and steel; lead and zinc; metallurgical fundamentals, ore dressing, etc.

ADVERTISING PAGES REMOVED

Foundry Industry Is Stimulated By Equipment Display

(*Continued from page 33*)

etc., were used by the Sand Products Corp., Detroit, to illustrate uses of its line of sands. Mullite Refractories Co., Shelton, Conn., displayed its shapes and cements for lining furnaces, crucibles and refractories of different types. Bottled samples of molding sand, bonding materials, silica and lake sand were important features of the exhibit of Walter Gerlinger Inc., Milwaukee.

Great Lakes Foundry Sand Co., Detroit, set forth its quartz blast sand, clay bonds, bentonite, silica grits, firestone and coke, in specially built display boxes. Manley Sand Co., Rockton, Ill., Standard Silica Corp., Ottawa, Ill., and Carpenter Bros. Co., Inc., Milwaukee, occupying adjacent booths, showed respectively four photographs of pits, mining facilities and products, a map of mines and production centers, a listing of distributors and a graded display of silica, sandblast sand and special core sand, and lastly, using a photograph of its laboratory facilities as a focal point, the Carpenter company pointed out by attractive arrangement its types of products. Houghland & Hardy Sand Co., Evansville, Ind., was represented by the latter company. William K. Wallace, Milwaukee, and Peerless Mineral Products Co., Conneaut, O., collaborated in their showing of molding sands, refractories, bentonite, steel abrasives, etc., in the central arena.

Special shapes and a large variety of refractories, tap hole, breast brick, ladle linings, bottoms, etc., took precedence in the booth of the Pyro Clay Products Co., Oak Hill, O. Sprinkman Sons Corp., Chicago, illustrated samples of its intermediate grade fire brick made by the dry press process, light weight castable refractory insulation, cement, and flint clay fire brick. In addition to a showing of its new process fire brick, made by a de-airing operation whereby air is extracted from the clay during manufacture, Chicago Retort & Fire Brick Co., Chicago, attracted attention of visitors by a scale, asking the number of pennies required to balance a brick.

Zanesville Sand Co., Zanesville, O., and Industrial Minerals Co., Lancaster, O., combined to illustrate 20 grades and types of silica, molding sand and fire clay. Mexico Refractories Co., Mexico, Mo., and Fire Brick Engineers Inc., Milwaukee, showed fire clay brick, asbestos cements, special shapes, etc. A large facsimile of its book entitled "Sound Castings and Clean" was featured at the exhibit of Taggart & Co., Philadelphia, which included that company's special blended natural sand. Eugene W. Smith Inc., Evansville, Ind., and Wehenn Abrasive Co., Chicago, arranged a mutual exhibit illustrative of their sand facilities, pits, etc., with photographs of mines and plants.

Illustrates Use of Insulation

Three charts with a lighted miniature installation were used by George F. Pettinos Inc., Philadelphia, to show the results obtained by an insulated as against an uninsulated container. Phases of insulation were shown by open hearth and annealing furnace and core oven photographs. The portable moisture tester, operating by pressure and calcium carbide, was emphasized by the Alpha-Lux Co. Inc., New York, in addition to its refractory materials, A. P. Green Fire Brick Co., Mexico, Mo., devoted most of its space to malleable iron refractories, arranging them in lighted tiers. The Laclede-Christy Clay Products Co., Chicago, featured an effective panorama of its stove putty, furnace cement, and variety of refractory installations.

Cleveland Quarries Co., Cleveland, had motion pictures of its quarry operations and attractive color photographs of pits and storage plants, with samples of silica firestone for lining mixers, cupolas, acid tanks, etc. Whitehead Bros. Co., New York, featured a lighted photo of a typical deposit of Albany molding sand and presented its line of seacoal facing, core binders, steel shot and grit and molding sands. Types of molding, milling and silica sands were the chief objects of interest in the exhibit of George M. Pendergast & Co., Milwaukee, while the Ayers Mineral Co., Zanesville, O., had bottled samples of its molding and core sands with two color photographs of affiliated plants and quarries. Its new publication, "Bentonite in the Foundry," a treatise on the properties and uses of bentonite as applied to foundry practice was the major portion of the showing of F. E. Schundler & Co. Inc., Joliet, Ill. That company also emphasized, by sign display, its insulation and nonmetallic divisions.

Display Safety Appliances

Numerous companies, alert to the possibilities of furthering safety in foundries, illustrated progress being made in that field by their presentation of recent improvements and developments. Associated Guard Manufacturers, Chicago, acquired considerable attention through its largest boot in the world, size 168, 7 feet 6 inches high, and its portable vacuum cleaner. Protective Equipment Inc., Milwaukee, described uses of asbestos coverings, leggings, goggles and lenses, and the Mine Safety Appliances Co., Pittsburgh, showed its clean air blower for washing, cooling, and humidifying air for supplied air masks, skull guards, gas indicators and inhalators.

Standard Safety Equipment Co., Cleveland, used a revolving exhibit for its masks, salt tablets, toe clips and shoes, and the Safety Equipment Service Co., Cleveland, had a machine demonstration of its unbreakable goggle lenses, numerous types of masks,

goggles and leggings. "Every 36 Seconds Eye Injuries Strike" was the claim of the American Optical Co., Chicago, in its booth, with appropriate comment following on the use of its eye equipment protection. Exhibit of the Martindale Electric Co., Cleveland, featured protective masks of soft rolled aluminum and a few electrical and mechanical maintenance tools. Employers Mutuals, Wausau, Wis., demonstrated equipment and methods for the prevention and control of industrial accidents and occupational diseases, giving phases of a recommended program. A windshield was set up by the Clersite Co., New York, as a working demonstration of its chemical compound for the elimination of condensation or frosting on goggles, eye-glasses, reflectors, etc.

Show Pattern Equipment

Important adjuncts to up-to-date foundry and pattern room operation were displayed by several companies in Mechanics hall. Kindt-Collins Co., Cleveland, illustrated its vibrators and disk grinders, Wells Mfg. Co., Three Rivers, Mich., operated its upright foundry saw for removing gates and risers, and Economy Tool & Machine Co., Muskegon Heights, Mich., had two new wire machines in operation for the automatic cutting and forming of core wires. Armstrong-Blum Mfg. Co., Chicago, was cutting 18 inches of steel with its high speed hydraulic hack saw. The unit feeds forward and back, operates at 70 to 160 strokes a minute and is claimed to be the largest in the world. The company also showed a full range of sizes, types and capacities applicable to cutting-off work with automatic hack and band saws.

Several new products were included among the sand core and mold testing equipment displayed by Harry W. Dietert Co., Detroit. These were a clay washing machine, a metallurgical microscope for examination of metal specimens, and a shop microscope for detail scrutiny of casting defects, foundry sands and machined parts.

E. Leitz Inc., New York, showed metal microscopes, photo-micrographic equipment, polishing machines and dilatometers. Laboratory microscopes also were presented by Adolph I. Buehler, Chicago, who also exhibited cutting machines, hydraulic presses and polishing apparatus. The Pyrometer Instrument Co., New York, featured its optical pyrometer designed for foundry use. Illinois Testing Laboratories Inc., Chicago, displayed its portable and wall type indicating pyrometers.

Producers of nonferrous metal ingots for foundry use were well represented. Companies displaying a wide and interesting variety of samples of brass, bronze and special alloy castings included: S. Berkenstein & Sons Inc., Chicago; L. A. Cohn & Bros. Inc., Chicago; Federated Metals division, American Smelting & Refining Co.; Benjamin Harris & Co., Chicago Heights, Ill.; H. Kramer & Co., Chicago; R. Lavin & Sons Inc., Chicago; William F. Jobbins Inc., Aurora, Ill.; and Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Steel flasks and wheelbarrows featured the exhibit of Sterling Wheelbarrow Co., Milwaukee. Federal Foundry Supply Co., Cleveland, displayed sand testing equipment, electric sifters and samples of bond and seacoal. The attractive booth of Frederic B. Stevens Inc., Detroit, called attention to a new catalog recently issued by this company and listing a wide variety of foundry equipment and supplies. Flasks, bottom boards, core plates and corrugated steel platforms and boxes were shown by Truscon Steel Co., Cleveland.

Show Variety in Flasks

Black, Sivalls & Bryson Inc., Kansas City, Mo., exhibited pressed steel flasks as well as steel bottom boards and squeeze boards. Various types of aluminum flasks were displayed by Hines Flask Co., Cleveland.

Turning pages of a large book listed the various facings and compounds offered by J. S. McCormick Co., Pittsburgh, and provided the center of interest in an attractive display. Typical cores were shown by the American Gum Products Co. and the Robeson Process Co., New York. E. J. Woodison Co., Detroit, employed animated figures in its exhibit of core wash, facings, parting and plumbago.

Pattern compound and portable pyrometers were shown by Tamms Silica Co., Chicago. Core oil suppliers represented by exhibits included Certified Core Oil & Mfg. Co., Chicago; Dayton Oil Co., Dayton, O.; Delta Oil Products Co., Milwaukee; Swan-Finch Oil Corp.; the Werner G. Smith Co., Cleveland; and Smith Oil & Refining Co., Rockford, Ill. Several of these showed a wide variety of interesting cores produced with the particular brand of oil being shown. Corn Products Sales Co., New York, exhibited samples of cores, as also did the Hercules Powder Co., Wilmington, Del., the Charles A. Krause Milling Co., Milwaukee, and the Oiless Core Binder Co., Cleveland.

Clay suppliers included Eastern Clay Products Inc., Eifort, O., and Mt. Jewett Fire Clay Co., Mt. Jewett, Pa. Seacoal and other facing compounds were displayed by the S. Obermayer Co. and the Penn-Rillton Co. The former also exhibited flasks. Other companies showed various types of facings were the Hill & Griffith Co. and the West Virginia Coal & Coke Corp., Cincinnati. United States Graphite Co., Saginaw, Mich., and Donald Sales & Mfg. Co., Milwaukee, showed seacoal, core washes and plumbago and graphite. United Compound Co., Buffalo, displayed its vent wax. Cleveland Flux Co., Cleveland, exhibited various types of foundry fluxes.

Melting units and allied equipment which are essential in the operation of every foundry drew considerable attention, with the leading manufacturers represented. The Ajax Electric Furnace Corp., Philadelphia, and the Ajax Electrothermic Corp., Trenton, N. J., had their booths arranged as rest rooms for exhibition visitors. Campbell-Hausfeld Co., Harrison, O., showed three of its oil or gas-fired crucible furnaces, and a ladle heater. One of the furnaces was the stationary type, another was a tilting type while the third was a newly developed small tilting type furnace designed to replace coke fired furnaces. Crucible Furnace Co., Charlottesville, Pa., arranged its booth as a rest room.

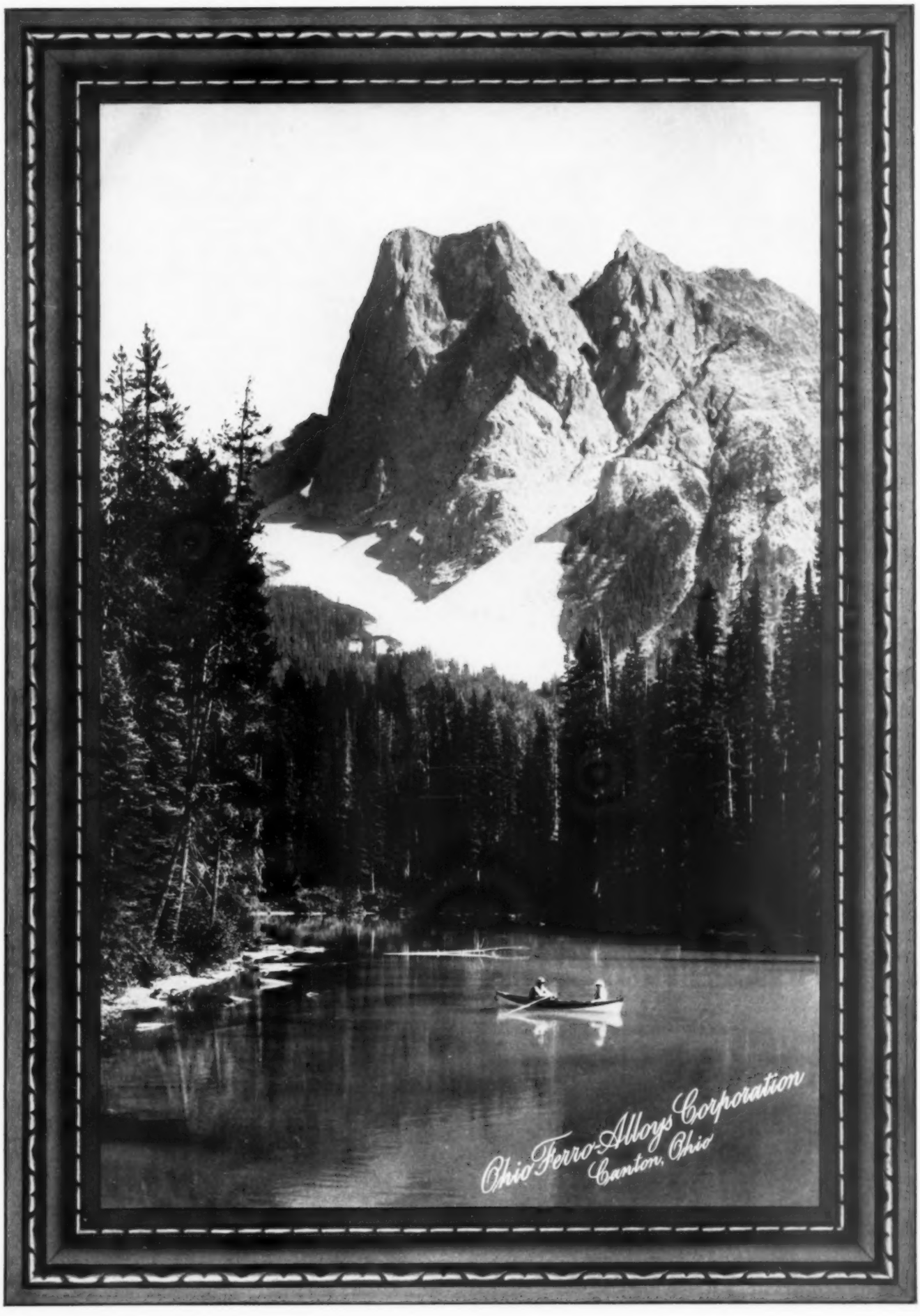
New Electric Furnace

Detroit Electric Furnace Co., Detroit, displayed its new 350-pound furnace which is shorter than the old type, and expanded in the center to form an ovoid melting chamber. In addition the furnace is equipped with automatic controls for rocking. The firm also showed numerous types of castings made from metal melted in its furnaces, and a new type of monolithic lining material. Fisher Furnace Co., Chicago, exhibited five of its furnaces including stationary and tilting type for nonferrous and ferrous alloys, centrifugal pressure blowers, and fuel oil burners.

Monarch Engineering & Mfg. Co., Baltimore, Md., showed three of its tilting type or gas fired furnaces, crucible tongs, and photographs of its varied line of melting and heat treating equipment. Pittsburgh Lectromelt Furnace Corp., Pittsburgh, displayed photographs of various installations of its melting and refining furnaces. Whiting Corp., Harvey, Ill., had a background illustrating its various melting units, and displayed some of its insulated, covered ladles; its continuous, desulphurizing ladle; a turbo blower with automatic control, and a core oven stoker.

American Crucible Co., Shelton,

(*Continued on page* 112)


Ohio Ferro-Alloys Corporation
Canton, Ohio

(*Continued from page* 110)

Conn., displayed its line of crucibles, mullite refractories for furnace linings, ladle stirrers and skimmers, and combustion chambers for oil or gas fired furnaces. Electro Refractories & Alloys Corp., Buffalo, N. Y., showed some of its silicon carbide crucibles, mullite refractories, and samples of its line of nonferrous alloying agents. Joseph Dixon Crucible Co., Jersey City, N. J., exhibited its line of graphite crucibles, furnace and crucible covers, crucible bases, ladle stoppers, and sleeves, and other furnace specialties. It also showed assembled stoppers and sleeves.

Lava Crucible Co. of Pittsburgh showed various sizes of its graphite crucibles, furnace and crucible covers, base blocks, and super-refractory brick made of silicon carbide and of mullite. Vesuvius Crucible Co., Swissvale, Pa., exhibited graphite crucibles, stopper heads and nozzles, skimmers and stirring rods. International Graphite & Electrode Corp., St. Marys, Pa., displayed some of its graphite electrodes for electric furnaces.

Foundry Equipment Co., Cleveland, in addition to numerous photographs of installations of its core and mold drying equipment, showed a drawer type core oven, and one of its combination oil and gas fired, recirculating heaters for core or mold drying ovens. The firm also showed its automatic control and safety equipment for those units. Willsea Works, Rochester, N. Y., had its booth arranged as a rest room.

Air Control Apparatus

Foxboro Co., Foxboro, Mass., displayed its automatic air control device in addition to other indicating, controlling, and recording instruments. The automatic air control device was in operation, attached to a blower in operation by Spencer Turbine Co. Ingersoll-Rand Co., New York, had its automatic air weighing control in operation with one of its centrifugal type blowers. LeRoi Co., Milwaukee, Wis., displayed one of its 2-stage, 60-cubic foot compressors, and one of its supercharger type, 100-cubic foot capacity air compressors.

Roots Connersville Blower Corp., Connersville, Ind., showed a small and a large, positive displacement blower for furnace or cupola application. Schramm Inc., West Chester, Pa., had in operation one of its compressed air units which supplied air for various operating exhibits at the exhibition halls. Spencer Turbine Co., Hartford, Conn., had in operation its heavy duty vacuum cleaner, and one of its multistage centrifugal blowers. The latter was operated in connection with an automatic air control device made by the Foxboro Co.

Modern Equipment Co., Port Washington, Wis., showed its new cupola charger in operation. It is a skip type similar in arrangement to those used for blast furnace charging. The bucket is in a holder or guide sliding on rails which permits the former to remain vertical at all times. In addition the firm exhibited various types of its covered and insulated mixing ladles, pouring ladles, electric and hand operated pouring devices, and an overhead crane and monorail system. American Brake Shoe & Foundry Co., New York, showed abrasion resistant cast iron plows, mill linings, and rollers.

Remove Dust from Air

A wide variety of equipment for the removal and suppression of dust in the foundry was displayed. American Air Filter Co. Inc., Louisville, Ky., showed several of its dust removing devices which combine centrifugal precipitation, and a water spray. One of the machines was in operation for demonstration purposes. In addition several sizes of rotors used in the dust removers were shown. American Foundry Equipment Co., Mishawaka, Ind., displayed in addition to its dust arrester equipment, a rotating abrasive blast machine, a floor type sand cutter, a rod straightener and shear, a sausage-type core machine, a core cutting-off and tapering machine, electric space heaters, aluminum snap flasks and jackets, and numerous castings cleaned in its abrasive blast machines.

C. O. Bartlett & Snow Co., Cleveland, had in operation its oil-froth dust collecting machine, and a working model of its car-type, mold conveyor. The Hydro-Blast Corp., Chicago, had its booth arranged as a rest room. The Macleod Co., Cincinnati, O., exhibited an abrasive blast machine, an abrasive blast utility gun, blacking sprayers, compressed air-type torch, and a ladle dryer. Parsons Engineering Corp., Cleveland, showed an accurate scale model of its dust arrester equipment in operation.

Pangborn Corp., Hagerstown, Md., had a portion of its booth arranged to represent a ship's cabin, and in addition exhibited its airless abrasive blast machine attached to its dust arrester. These were in operation as was the firm's new electrostatic dust removal device. Peoria Sand Blast Mfg. Co., Peoria, Ill., displayed a compressor and four sizes of pressure type abrasive blast machines. N. Ransohoff Inc., Cincinnati, O., had in operation a combination wet tumbling mill attached to a saw dust drying mill for drying the castings. Sawdust used was dried automatically and used over again.

Roloff Engineering Co., Milwaukee, Wis., showed several types of fans, and blowers. Ruemelin Mfg. Co., Milwaukee, Wis., displayed its tubular type blast filters, blast cleaning cabinet, abrasive cleaning machine, and compresses air dryer. Claude B. Schneible Co., Chicago, had in operation its wet method, dust suppression system. W. W. Sly Mfg. Co., Cleveland, had in operation a cloth-bag type dust filter for continuous operation, an abrasive blast helmet unit, a new wet-type dust collector, and numerous photographs of installations of its equipment in foundries.

U. S. Hoffman Machinery Corp., New York, demonstrated its heavy duty, portable vacuum foundry cleaning unit, and also showed a centrifugal blower for furnace use. Blaw-Knox Co., Pittsburgh, showed its single line, hook-on type clamshell bucket.

Ajax Metal Co., Philadelphia, displayed its line of nonferrous ingot metal, and numerous statuary castings and other products made from those metals.

Material Handling Equipment

Modern methods for handling materials and products afford important economies in foundry operation, consequently foundrymen made most of their opportunity to inspect new equipment available in this field. Handling equipment displayed included tractors and trucks, skid boxes, conveyors, hoists, cupola charging units, and numerous accessories intended to make a shop up to date.

Automatic Transportation Co., Chicago, manufacturer of industrial power trucks, tractors and cranes for heavy-duty service in capacities up to 30 tons, showed an electric storage battery low-lift truck equipped with a new type rotor brush power flow controller. This unit was of 3-ton capacity and the platform affords a lift of 6 inches. Two models of storage battery trucks were shown by the Elwell-Parker Electric Co., Cleveland. Both were of 3 tons capacity—one was of the elevating platform type and the other was of the high-lift tiering type.

A 2-ton storage-battery lift truck was featured in the booth of Yale & Towne Mfg. Co., Philadelphia, also a 1½-ton hand lift truck for handling trailers, tote boxes, etc. Four models of chain hoists also were available for inspection, two of these being of the trolley type and two stationary type. Mobile equipment exhibited by the Mercury Mfg. Co., Chicago, included a 1000-pound gasoline-engine powered three-wheel

(*Continued on page* 116)

ADVERTISING PAGES REMOVED

GLOBE SHOT

H.C. CHILLED GLOBE SHOT

Whether you require steel abrasives for use in centrifugal blasting equipment or for use in blasting machines using compressed air, there is a proper size of Globe Shot or Grit specially adapted to provide just the finish you desire—for large or small, light or heavy, grey iron, malleable or steel castings, as well as forgings, billets, sheets, etc.

Thirty years experience in the manufacture of steel abrasives and thirty years contact with cleaning problems of many varied kinds, have enabled Globe to develop superior steel abrasives—steel shot and steel grit. The fact that leading foundry supply dealers, and blasting equipment manufacturers recommend their use for best cleaning results is a tribute to Globe's years of effort to advance efficiency and economy in cleaning.

The efficiency and economy of any cleaning machine depends upon the abrasive used in it. Why invest large sums in modern and efficient cleaning equipment and then limit its usefulness by using anything except the most efficient steel abrasives?

Globe's leadership in quality—in hardness, toughness and cleaning efficiency is unquestioned—and Globe's unequalled production facilities enable us to provide prompt shipment to users of large quantities insuring continuous operation of their cleaning departments without delay.

THE GLOBE STEEL ABRASIVE CO.

Dept. F Mansfield, O.

Established 1907

CORNERED STEEL GLOBE GRIT
REG U.S PAT OFF.

GLOBE CORNERED STEEL GRIT

The particular structure of Globe Grit provides longer life of the abrasive and consequent lower abrasive costs. Ask for genuine *GLOBE "Cornered" STEEL GRIT.*

(*Continued from page* 112)

tractor coupled to a live trailer made of steel; a 1½-ton electric fork lift truck; and an electric platform truck. Another piece of equipment was a live trailer with a steel dump-type body. Three gasoline powered trucks were demonstrated by Clark Tructractor Division of Clark Equipment Co., Battle Creek, Mich. One was a tractor capable of hauling 30 tons in live trailers; the second was a 3-ton platform lift truck; and the third was a 3-ton tiering machine.

Ready-Power Co., Detroit, presented several gasoline-electric units for powering electric industrial trucks such as oven chargers, tractors, and similar equipment. Hand operated equipment of the lighter type was exhibited in the space of the Sabin Machine Co., Cleveland. This included one-man, two-wheeled trucks for moving heavy barrels, drums and kegs; and special live skids and platforms. A choice of steel or pneumatic wheels is available for all of this equipment. This company also showed a portable elevating table for holding and handling work in machine shops and process shops.

Mounted on Pneumatic Tires

Devices for handling barrels, drums, skid platforms, etc., were exhibited by Barrett-Cravens Co., Chicago. This included lift trucks, drum racks, a portable elevator, storage racks and barrel truck skids. A core truck which had its table mounted on pneumatic cushions to prevent jarring and breaking of cores attracted attention in the booth of the Chicago Mfg. & Distributing Co., Chicago. Other items which this manufacturer had available were flasks, skimming equipment, hand chipping hammers and blow valves.

Mathews Conveyer Co., Ellwood City, Pa., demonstrated its recently developed shock-absorbing, resiliently mounted roller conveyor. A 1900-pound steel billet was lowered roughly onto a section of the conveyor to show that rollers were capable of cushioning shocks and were forced to assume their proportionate share of the load. In addition to this equipment, the company exhibited a complete line of conveyor rollers and mountings.

A complete line of equipment used in conveyors was shown by the Chain Belt Co., Milwaukee. This included conveyor rollers for belt conveyors. An apron conveyor and mold car were mounted on sections of track with mirrors set on an angle beneath to make bottom side construction visible to the observer. Dodge Mfg. Corp., Mishawaka, Ind., presented a complete line of power transmission and materials handling equipment. Among these items were pillow blocks, clutches, pulleys and conveyor rollers.

Through an ingenious use of neon lights, the Falk Corp., Milwaukee, illustrated the action of its flexible steel couplings under conditions of parallel and angular misalignment. Other products of that manufacturer were helical gears, speed reducers, heavy drives, motor reducers, steel castings and welded construction. Conveyors for handling molds constituted a major line exhibited by the Palmer-Bee Co., Detroit. Auxiliary lines were speed reducers, idlers and aerators. A wide variety of electric motors for special and general service in industrial fields comprised the exhibit of the Louis Allis Co., Milwaukee.

Toledo Scale Co., Toledo, O., showed several types of industrial scales, these including bench types, heavy duty floor types, laboratory types and portable types. One of the platform scales was equipped with a device which automatically prints a record of the weights. Of interest, in the display were two intricate castings which house the scale mechanism.

Light electric and air-operated tools are used in large numbers in the foundry industry for grinding and cleaning castings. Several manufacturers displayed this class of equipment. Black & Decker Mfg. Co., Towson, Md., exhibited a complete line of universal and high cycle portable electric tools for operating grinding wheels, brushes, buffs, drills, etc. Demonstrated also was a small industrial type of vacuum cleaner said to be capable of picking up metal without damaging the apparatus.

Rotor Air Tool Co., Cleveland, demonstrated and displayed numerous types of air-operated and high-cycle portable tools for abrasive wheels and drills. In addition to several sizes of portable electric grinders and two-wheel bench grinders, the United States Electrical Tool Co., Cincinnati, operated a swing frame grinder and an adjustable-speed alternating current two-wheel floor grinder.

Variable Speed Floor Grinder

First showing of a new alternating-current variable-speed floor grinder was made by the Safety Grinding Wheel & Machine Co., Springfield, O. This machine is built in 24 and 30-inch sizes and was shown in the latter size. Setting of the wheel guard in proper position determines the speed of operation of the wheel and within the range of the drive, an infinite number of speed changes are available. This company also displayed portable and floor stand snagging grinders and a wide variety of wheels.

Floor grinders in several sizes were shown by Hammond Machinery Builders Inc., Kalamazoo, Mich. These included tool and production grinders in light and heavy-duty types; all were equipped with totally-enclosed fan-cooled motors.

Abrasive wheels and abrasives were exhibited by a considerable number of companies. Aside from the variety of wheels, oil stones, rubbing bricks and specialties, high-temperature refractories and cements, the booth of the Norton Co., Worcester, Mass., was of interest. The company's products passed on an endless belt from one side of the booth to the other. In two panels, moving pictures showed typical grinding operations. Featured in the center of the booth of the Carborundum Co., Niagara Falls, N. Y., was a 10-foot diameter revolving model of the earth with the continents and oceans shown in relief in abrasive materials. Ten colored transparencies showed interesting grinding operations. Exhibited

(*Concluded on page* 118)

Apprentice Prize Winners

Gray Iron Molding

1st—Fred Osterman
International Harvester Co.
Rock Island, Ill.

2nd—John Waddington
Brown & Sharpe Mfg. Co.
Providence, R. I.

3rd—Albert Lamp
Blackhawk Foundry & Machine Co.
Davenport, Iowa.

Steel Molding

1st—Stanley Raskiewicz
Sivyer Steel Casting Co.
Milwaukee, Wis.

2nd—Kazimir Paliwoda
Cleveland Trade School
Cleveland, O.

3rd—John Kelly
Maynard Electric Steel Casting Co.
Milwaukee, Wis.

Nonferrous Molding

1st—John Elka
Allis Chalmers Mfg. Co.
Milwaukee, Wis.

2nd—Casimer Kotowicz
Ampco Metal Corp.
Milwaukee, Wis.

3rd—Mike Kost
Cleveland Trade School
Cleveland, O.

Pattern Making

1st—Fred Henz
Western Pattern Works
Cleveland, O.

2nd—Alex Allardyce
2509 Alter Road
Detroit, Mich.

3rd—George Sharrar
French & Hecht, Inc.
Davenport, Iowa.

BACK FROM THE CONVENTION

The wide-awake foundryman will return from the Convention with a wealth of new ideas for increasing the efficiency, production,—and even more important, the profits of his shop. And if the keen interest shown in the new Herman Molding Machines may be used as a general index, the Hermans are going to play an important part in modernizing foundries in the near future.

The new Hermans have proven that they can increase production from 2 to 5 times over old methods of making molds. They are adaptable to every type of job and their ability to *increase profits* is demonstrated by the fact that *foundrymen everywhere are installing Hermans.*

If you did not make arrangements at the Convention for a Herman representative to study your present production set-up—do so now. He will gladly do this without obligation to you.

"If It's a HERMAN It's Worth Using; It Made Its Way by the Way It's Made."

HERMAN PNEUMATIC MACHINE CO.

PITTSBURGH, PA.

(*Concluded from page* 116)

throughout the booth were grinding wheels and stones and refractory materials used in foundry furnaces.

Resinoid and vitrified wheels for use in swing frame, floor stand and portable grinders were exhibited by the Sterling Grinding Wheel Co., Tiffin, O. Macklin Co., Jackson, Mich., operated an abrasive cut-off machine and through use of photographic transparencies set in a counter showed interesting grinding operations performed with the wheels which the company produces. Abrasive wheels which meet the full range of grinding operations in the foundry were displayed on Thursday and Friday by the Abrasive Co., division of Simonds Saw & Steel Co., Philadelphia. Unfortunately the material for this display was lost in transit for several days. Steel grit and shot and metallic abrasives suitable for every form of metal cleaning were shown in varicus grades in the booth occupied jointly by the Globe Steel Abrasive Co., Mansfield, O., and Pittsburgh Crushed Steel Co., Pittsburgh. Steel shot and grit for rapid and economical cleaning in pressure and airless machines was shown by samples by the Steelblast Abrasives Co., Cleveland.

Feature Use of Alloys

Ferroalloys and alloying elements used in iron, steel and nonferrous castings, also specimens of castings alloyed with these materials, were shown by several well-known companies. International Nickel Co. Inc., New York, utilized an interesting mechanism to illustrate the effects of various additions on corrosion resistance, toughness, machinability, abrasive resistance, strength, density and pressure tightness, and heat resistance.

Electro Metallurgical Co., New York, utilized a large colored transparency to illustrate melting action in a cupola. A large table showed cost figures for ferroalloy addition; another table enumerated the purposes for which ferroalloy additions are made in the ladle. This display sought to show how high quality iron can be produced by accurate control of ferroalloy additions. Ferrovanadium, ferrosilicon, ferrotitanium, ferrochromium and chromium metal were shown by the Vanadium Corp. of America, New York. A few typical castings alloyed with those materials completed that display. Photographic transparencies showing applications of calcium molybdate and ferromolybdenum to iron and steel castings comprised the attractive exhibit of the Climax Molybdenum Co., New York.

A stationary acetylene generator with a capacity of 300 cubic feet per hour, a complete assortment of welding and cutting torches, tips, regulators, manifolds, etc., comprised equipment shown by the Linde Air Products Co., New York. Welding and cutting demonstrations were performed. Flame cutting and welding equipment was demonstrated by the Air Reduction Sales Co., New York, to show the advantages of composite construction involving castings and rolled steel. A large motor base so built was exhibited. This company also showed a new type bar cuttter having a range of from 3 to 12 inches, an acetylene generator, welding rods, and a full complement of welding and cutting accessories.

Harnischfeger Corp., Milwaukee, showed and demonstrated several types of arc welding equipment applicable to the foundry. Other equipment included welding electrodes, electric motors for industrial use and electric hoists. Wilson Welder & Metals Co. Inc., New York, demonstrated electric arc welding equipment.

Various types of kiln dried white pine lumber for making patterns and lumber for foundry flask construction were shown by the Edward Hines Lumber Co., Chicago.

Group showers and wash basins for industrial plants were shown by the Bradley Washfountain Co., Milwaukee. The washbasins were of three types, one of cast granite material, one of baked enamel and the third of pressed stainless steel.

Melting Practice Is Subject At Iowa

Quad-City Chapter of the American Foundrymen's association met April 19 at the Blackhawk hotel, Davenport, Iowa, for its regular meeting. Following dinner, Hyman Bornstein, Deere & Co., Moline, Ill., gave the principal talk on "Melting Practice in Foundries" before 125 men. He centered his description around one of the large tractor foundries and spoke of the handling and transportation of materials used in its cupolas. Personnel in charge of the melting processes, operation and maintenance of the cupolas were considered by the speaker.

Clyde H. Burgston made the following report of the nominating committee: For chairman, P. T. Bancroft; vice chairman, M. J. Gregory; secretary-treasurer, J. Morgan Johnson; directors for 1 year, T. J. Frank, Mr. Bornstein, F. W. Kirby, J. H. Ploehn, F. J. Dananfelser, A. E. Hageboeck, H. A. Deane, Mr. Burgston and E. A. Gullberg; trustees, Mr. Hageboeck for 2 years, Mr. Ploehn for 1 year and Mr. Frank, retiring chairman, for 3 years.

Los Angeles Chapter Is Organized

Seventy-seven representatives of the foundry industry of Southern California met April 21 at the Clark hotel, Los Angeles, for the purpose of organizing the Los Angeles Chapter of the American Foundrymen's association. Robert Gregg, general foundry superintendent of the Reliance Regulator Co., Alhambra, Calif., acted as temporary chairman and Charles J. P. Hoehn, president, Enterprise Foundry Co., San Francisco, was the principal speaker.

Dr. Donald Clark, California Institute of Technology and chairman of the Los Angeles Chapter of the American Society for Metals, extended greetings of that organization and assured its full co-operation. He was followed by J. C. Blake, Victor Welding & Equipment Co., Los Angeles, who represented the American Welding society. Howard Kegley, mining editor, *Los Angeles Times*, president of the Mining Association of the Southwest, spoke of the work which that organization had done.

Albert Zima, International Nickel Co., Los Angeles; Don Schindler, president of the Engineers' club, Los Angeles and H. L. Eggleston, president of the Los Angeles Chapter of the American Society of Mechanical Engineers, extended best wishes of their respective organizations and outlined some of the pitfalls which should be avoided.

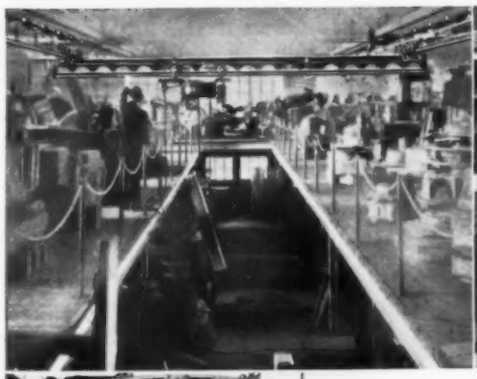
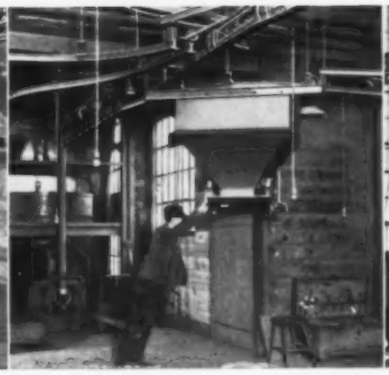
Following Mr. Hoehn's presentation of the aims and objectives of the association, George L. Kennard, manager of the Pacific Coast Founders association, San Francisco, explained the manner in which that organization is conducted and suggested means by which a chapter can fulfill its primary function, namely, to aid in the broad dissemination of foundry knowledge and the training of men from the apprentice to the manager.

It was decided to retain the temporary officers until the annual meeting in June. The following committee chairmen were appointed: Steering committee, J. H. Wilkins, Vernon Foundry Co., Los Angeles; program committee, Mr. Zima; by-laws committee, Cy Kimberley, Los Angeles Steel Casting Co.; and membership committee, Ed. Green, Axelson Foundry & Machine Co., Los Angeles.

Too often protective equipment is purchased entirely on a price basis and as a result many preventable injuries occur that could have been eliminated had proper consideration been given to the importance of the problem.

ADVERTISING PAGES REMOVED

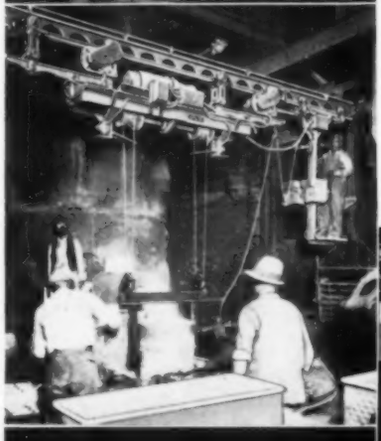
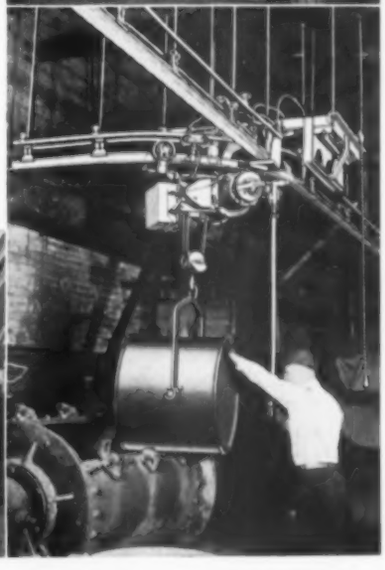
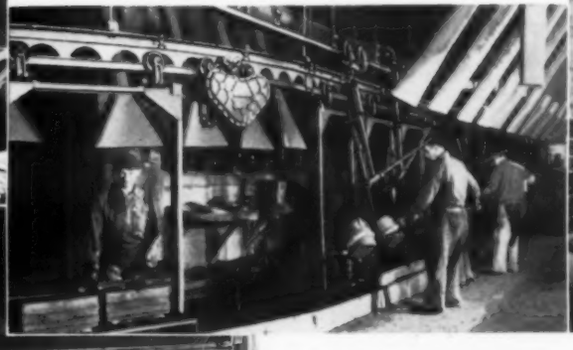
OVERHEAD MATERIALS HANDLING EQUIPMENT

YOUR PRIMARY THINKING

is to modernize obsolete plant conditions, increase production records

- A well planned Materials Handling System will help — a Cleveland Tramrail engineer is available to assist in the planning.
- Our advice is to first plan your Materials Handling System and from THIS BASIS modernize your plant.
- Hundreds of Cleveland Tramrail installations have been made in the Foundry Industry.

Consult your telephone directory under Cleveland Tramrail.

CLEVELAND TRAMRAIL

DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO

1155 Depot St.

WICKLIFFE, OHIO

Fig. 8—Light weight service box castings are molded in special narrow flasks and pop gated on top

Revamp Eastern Foundry

(*Continued from page* 36)

loaded while resting on a section of roller conveyor which extends past a platform scale. As each bucket is loaded and weighed it is pushed toward the end of the roller conveyor. In this manner a reserve is provided to prevent any delay later when the charging crane is engaged in conveying them to the cupola. The loaded buckets at the ends of the line are picked up first and emptied. The empty buckets are returned to the center of the line in front of the scale. The system provides for a certain measure of flexibility, an insurance against any interference with the smooth running of the cupola, in the event of minor delays for one reason or another in the yard.

Method of Charging Cupola

The cupola charging device is of a type that has become fairly familiar in recent years. The operator travels with the cab which supports a projecting member and is equipped with hoisting apparatus. The bucket is in two parts, a bottom and ring. A steel eye bolt is attached to the center of the bottom. The hook on the hoist engages the eye in the bolt and lifts the load. When the bucket is inserted into the cupola as shown in *Fig.* 7 four exterior hooks engage the rim and prevent that part from sinking when the operator lowers the load supported by the eyebolt attached to the bottom. The result is that the bottom sinks away from the rim and the charge of material on the inside, falls into the cupola. The cone shaped bottom of the bucket helps distribute the charge in a fairly uniform layer. When the load is discharged the bottom is pulled back into place and the bucket is returned to the yard for another load. As a minor point of interest, it will be noted that the lower part of the cupola charging door opening is only about 10 inches above the steel floor in the vicinity.

Since Builders Iron Foundry accepts orders for practically any type of iron casting weighing from a fraction of a pound to 30 tons it is apparent that approximate segregation in various sections of the foundry is desirable for molding purposes and for distribution of the metal. For this reason all the castings weighing 1-ton or more are made in the original foundry building, a substantial brick building divided into two bays longitudinally by heavy cast iron columns and brick arches. Dry sand cores are made in one section and the molds are made in the other. A transfer track connects the two.

Many of the molds in this section are rammed under a stationary type sandslinger. Occasionally the casting is poured in a green sand mold, but nearly all the molds are dried in two large ovens at the end of the bay. Loam molding is extensively practiced in this section of the foundry and of course these molds are dried thoroughly before the iron is poured into them. Spindles are erected at suitable distances apart along one side of the foundry and several spindles also are available on the opposite side. A gratifying measure of success has been experienced in breaking in intelligent young men on this class of work under the supervision of highly skilled experienced loam molders. The men are paid according to a bonus system in which an estimated number of hours are allowed for the job. If the work is completed in less than the estimated time, the workman benefits to that extent.

Typical molds in various stages of construction are shown in *Figs.* 1, 2 and 3. These molds are for castings that form parts of venturi meters. These devices are machined and assembled in the company's machine shop and represent a special line of manufacture in which the company has been engaged for many years. They are built in all sizes and for a wide range of applications.

Sweep Core on Barrel

Many of the large cylindrical cores, either straight or tapered are constructed in the manner shown in *Fig.* 6. This particular core is for a 24-inch tube and is made by winding hay rope on a cast iron barrel provided with numerous vent holes and with a supporting central spindle at each end. The end of one spindle is square in cross section to accommodate a crank handle by which an operator revolves the barrel while a second operator applies the hay rope and afterward, a coating of loam. The correct diameter and contour is secured by attaching a straight edge to the two ends supports at the proper distance from the center of the barrel. In effect the assembly is a form of

(*Concluded on page* 124)

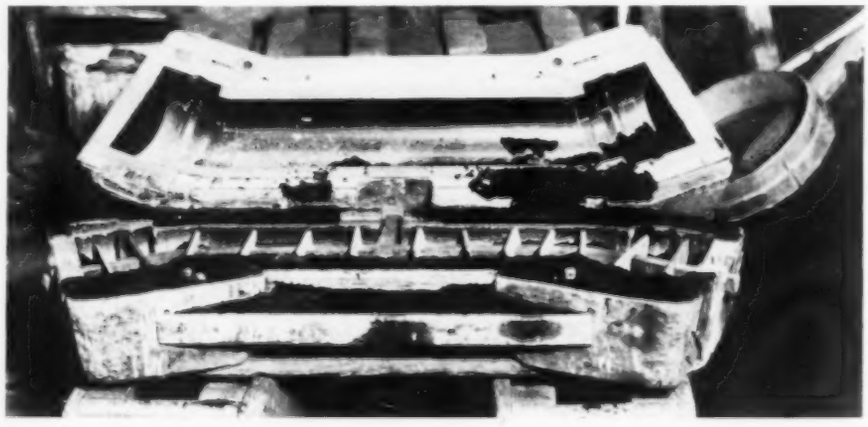
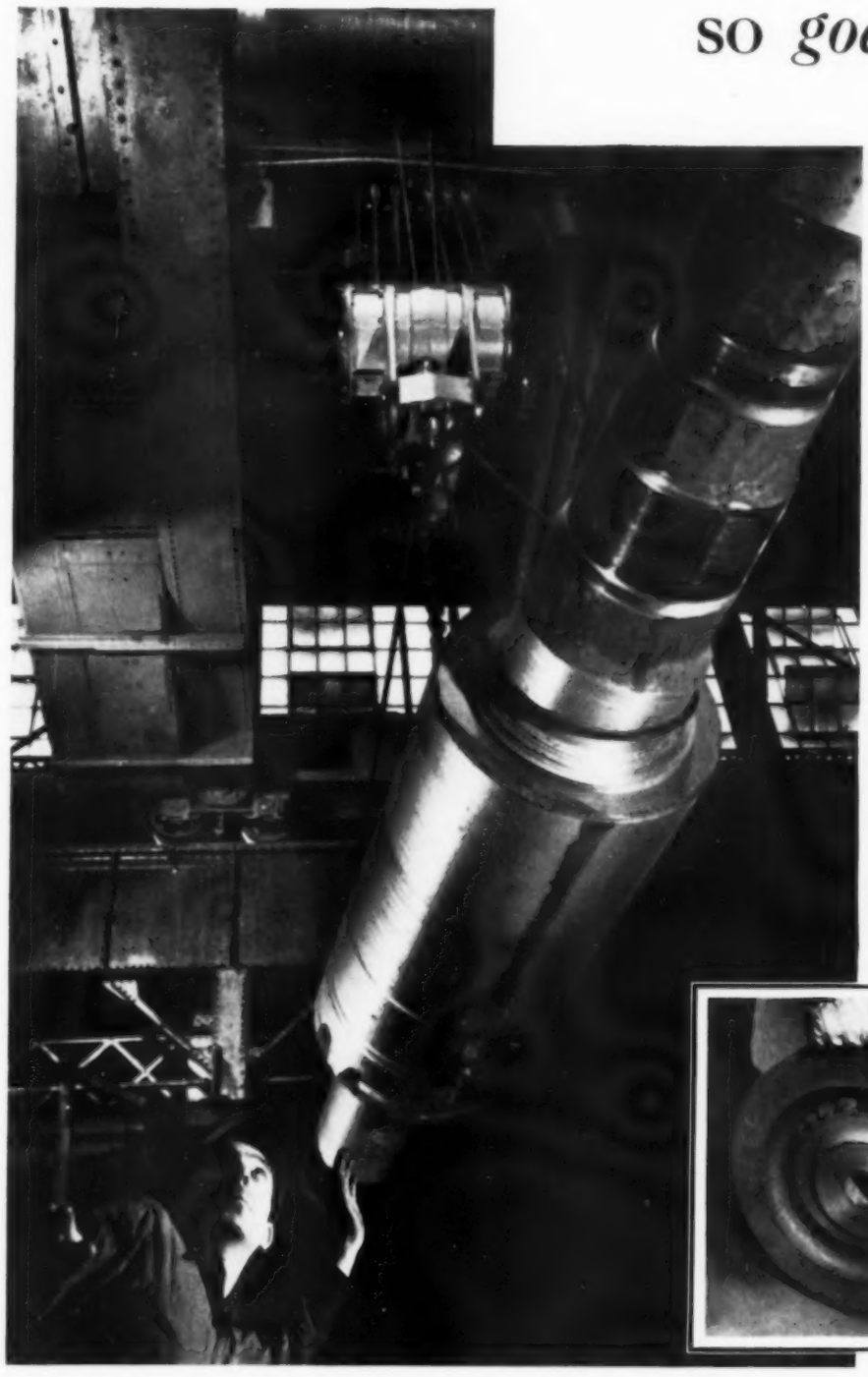


Fig. 9—Corebox for making green sand core for pipe fittings showing arbor with loose wings in place

As the Crane *goes* . . . so *goes* the Shop



WHEN your cranes are going strong, business is humming. Work goes through your shop uninterrupted. Your men work full days and full weeks. Profits keep rolling in.

But let your cranes lay off for wheel replacements, and what happens? Work piles up in the shop. Men lose time. Shipments may be delayed. Delays eat into your profits.

Machine-shop superintendents know this, and to cut time lost through crane-wheel maintenance down to less than half, they are specifying USS Wrought Steel "Rim-toughened" Crane Wheels. These wheels are built for long mileage. They outwear ordinary wheels by approximately 2½ to 1. Specify them both for new equipments and for replacements. You'll be pleased with the savings.

USS Wrought Steel Crane Wheels, double flange or single flange, are furnished rough machined, finish machined, and finish machined with bore and keyway—rim toughened or untreated, as desired.

Look for the letters "R.T." stamped in the rim. They mean "Rim-toughened" by the USS process to assure lasting hardness, safety, and long wear.

U·S·S WROUGHT STEEL CRANE WHEELS

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh *Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

(*Concluded from page* 122)

lathe. The rough coat is applied first and dried. Then a finishing coat of thin loam is applied to form a smooth, even surface. Cores made in this manner are true to size and shape.

Ingenious adaptation of existing equipment to which foundrymen in heavy work shops occasionally have to resort, was illustrated recently in the production of a number of grinder beds 36 feet in length. The mold made in an iron flask was too long for the oven. To overcome this apparent handicap the mold was placed in the oven with several feet projecting on the outside. The door of the oven was lowered until it rested on top of the mold. A temporary antiroom or porch then was built around the projecting part with steel sheets and the opening under the door on each side was closed in the same manner.

Describes Gating Method

Valves and pipe fittings in wide variety have constituted a considerable volume of the company's product for many years. The cope part of a dry sand mold for a 30-inch valve is shown in *Fig.* 5. Metal enters the mold through gates on top of the flanges. After the mold is closed a pouring basin is built on the top with branches leading to the pop gates. Obviously this method of gating presents many advantages including reduction in chipping expense, minimum strain on the mold, practical insurance against a runout. Probably the most important feature is that the method most nearly approaches theoretical perfection since the hottest metal constantly is on top and the casting gradually cools from the bottom upward.

Light and medium weight castings are made in a second foundry building which as previously stated extends parallel to the old or original foundry, and from which it is separated for approximately half the length by the heavy core making department. Floors in this modern, well lighted and amply ventilated foundry are laid out on both sides of a central gangway which extends from one end of the building to the other end. Floors on one side of the gangway are devoted to light hand molding, bench and squeezer machine work. Floors on the opposite side of the gangway are equipped with jolt, rollover, molding machines and with light hoists for handling molds too heavy to be lifted by hand.

Molds for long valve box castings shown in *Fig.* 8 present several interesting features. Special cast iron flasks are employed with shoulders near one end to accommodate the flange of the pipe. In this manner the amount of sand in the flask is reduced to a minimum. The core is oil sand, made in halves and pasted together. This type of core permits the use of five small pencil gates in the cope, instead of the usual type flat, shallow gates at one or both sides of the mold at the joint. The pencil gates are fed from a runner basin on top of the cope. The two parts of the flask are held together by a single clamp at each end, and the comparatively light *lift* on the core is taken care of by a few small perforated tin chaplets.

General method and equipment for making green sand cores for a wide variety of pipe fittings is illustrated in Fig. 9. Minor details in box and arbor of course vary for individual cases. The wood corebox is in two parts and the cast iron arbor is made up of a cast iron backbone and a number of semicircular wings with an opening in the center through which they are strung on the backbone.

Sand is rammed in both halves of the corebox and the surplus sand is scraped off flat at the joint. Then both parts are turned up on edge face to face. The assembly is rolled back with the drag part on the bottom. The cope half is lifted off, after which the core is lifted out of the drag half of the corebox and placed in the mold. The projecting ends of the backbone rest in suitable slots in the ends of the flask and support the core in the mold. After the cope is placed on the drag, a wedge on top of each projecting member prevents the core from rising when the mold is filled with metal.

Sand Meeting Held In Milwaukee

Members of the Milwaukee District Chapter of the American Foundrymen's association heard four speakers talk on the properties, use, handling, etc., of different types of sand, at their regular meeting April 16 at the Schroeder hotel, Milwaukee. Paul Bechtner, American Colloid Co., and N. J. Dunbeck, Eastern Clay Products Co., presented an interesting discussion of synthetic sand composition, characteristics, method of preparation and advantages under certain conditions.

E. N. King, Hoaglund & Hardy Sand Co., and E. W. Smith, Eugene W. Smith Inc., treated the subject of natural bonded sand. An open forum on sand problems was led by Ray Flansburg, metallurgist, Belle City Malleable Iron Co. This part of the program, devoted to a half hour of questions, has been started by the chapter on request. William F. Bornfleth, chairman of the chapter, presided at the general meeting.

Ohio Chapter Hears Equipment Talk

An interesting and varied series of slides presenting typical and unusual installations of core baking mold drying equipment were shown at the regular meeting of the Northeastern Ohio Chapter of the American Foundrymen's association, held April 8 at the Cleveland club. Speaking before approximately 100 men, C. A. Barnett, president, Foundry Equipment Co., Cleveland, emphasized that good melting and coreroom practices are important aids in eliminating preventable losses in the foundry. Exemplifying this, he stated that an intelligent study of coreroom routine in one plant led to a reduction in costs of over 50 per cent.

Mr. Barnett said that good sand cores r e q u i r e good sand and binders in addition to proper baking procedure. The three types of binders, oil, soluble and pitch, were discussed briefly. Outstanding factors affecting the quality of cores are temperature, baking time, atmosphere in the oven and the circulation of heat. The speaker advised the use of perforated core plates. In his discussion of dryers, racks, combustion chamber design and fuels, he said that coke is perhaps the most widely used fuel and coal and oil require good engineering and strict regulation. According to the speaker the recirculating heater has received widespread acceptance. The control of heat from the supply source is an important adjunct of good coreroom practice. His statements on core baking equipment applied directly to mold drying practice also. Mr. Barnett spoke briefly on green sand and dry sand practice.

Dale Cox, *Cleveland Plain Dealer* business writer, gave a short after dinner talk entitled "Will the Boom Sit Down?" He covered: The immediate probable outlook on labor; rising prices and the inflationary spiral; and prospects of business receiving further governmental control.

Benjamin D. Fuller, chairman of the nominating committee, submitted the following names for election to office for the coming term: Chairman, B. G. Parker, Youngstown Foundry & Machine Co., Youngstown, O.; vice chairman, L. P. Robinson, Werner G. Smith Co., Cleveland; secretary, J. H. Tressler, Hickman Williams Co., Cleveland; treasurer, R. F. Lincoln, Osborn Mfg. Co., Cleveland; directors to serve 3 years, Frank G. Steinebach, editor, THE FOUNDRY, Cleveland, Dan McAvoy, Grabler Mfg. Co., Cleveland, and F. R. Fleig, Smith Foundry Supply Co., Cleveland; director to serve 1 year, Frank J. Dost, Sterling Foundry Co., Wellington, O.

ADVERTISING PAGES REMOVED

Copper Alloy Iron

(*Continued from page* 40)

the total shrinkage is increased slightly and red shortness is not augmented by the copper addition."

Alloy irons containing one or more of the different alloying elements in addition to copper are coming forward almost as rapidly as the plain copper irons. These developments are so recent that little systematic study has been given to the various alloy combinations. It is difficult to do more than indicate the results that can be obtained.

Copper acts quite similarly to nickel in cast iron although its effects are not so pronounced. MacPherran[6], in a discussion of cupola high test iron containing 2.80 per cent carbon and 2.25 per cent silicon, points out that either 0.5 to 1.0 per cent nickel or the same amount of copper may be used to improve the machinability and close the grain of the iron. The effect of different combinations of copper and nickel upon the mechanical properties of electric furnace cast iron is given in Table III. These data are taken from unpublished work by Lorig[4] at the Battelle Memorial institute.

Exhaustive Studies Needed

These data show that copper or nickel alone, and copper and nickel together, at least up to a total of 3.0 per cent, were equal in their effect in raising the transverse strength, the tensile strength, and the brinell hardness of cast irons. The combination of copper and nickel appeared about as effective as when equivalent amounts of either element alone were used, but much more exhaustive studies need to be made to determine the most useful and economical ratio.

The proprietary alloy iron known as "NiResist" contains about 12 to 15 per cent nickel, 5.0 to 7.0 per cent copper, and 1.50 to 4.0 per cent chromium. It has excellent resistance to growth and oxidation at elevated temperatures, and good resistance to chemical attack. It can be machined readily.

Addition of chromium to cast iron has an opposite effect to that obtained by the addition of copper. By proper balancing of the two elements a valuable combination of toughness and hardness may be obtained. The Ford cam shaft, described by McCarrol and McCloud[7], is an alloy cast iron in which a controlled chill is obtained by the addition of chromium and copper. This iron contains 3.30 to 3.65 per cent carbon, 0.45 to 0.55 per cent silicon, 0.15 to 0.35 per cent manganese, 2.50 to 3.00 per cent copper, and up to 0.25 per cent chromium. The high copper content is used to stabilize the tendency of this iron to chill excessively.

No systematic studies of the effect of copper and chromium in combination have appeared but it is reasonable to expect that copper can be used to advantage over a range of cast iron compositions.

Manganese is always present in cast iron, usually in amounts of about 0.5 to 0.8 per cent. The effect of increasing the manganese alone has not been studied in detail. Eastwood, Bousu and Eddy[8] have reported an extensive study of the effect of adding combinations of copper and manganese to cast iron. The data showing the effect of these additions on the mechanical properties of cast iron, given in Table IV, have been selected from their results.

The conclusions given in the report, based on the study of 110 compositions, are that "the copper-manganese additions increase the hardness, tensile strength and compressive strength markedly, and improve the tranverse properties slightly in low alloy compositions. The effect on chill and graphitization is much like copper alone."

Molybdenum is widely used to improve the mechanical properties of cast iron. The combination of copper and molybdenum in proper balance results in greater improvement in mechanical properties than can be obtained by the use of either one alone. The copper molybdenum cast irons are used in the as cast condition but they respond readily to heat treatment with a further improvement in properties.

The effect of different combinations of copper and molybdenum upon the mechanical properties of electric furnace cast iron is given in Table V. These data are taken from unpublished work conducted by Lorig at the Battelle Memorial institute.[4]

The Ford Motor Co. has made extensive use of the special low carbon malleable irons containing substantial amounts of copper. These irons are cast white, and it is necessary to modify their properties by suitable heat treatments to obtain the required physical properties.

The cast crank shaft was introduced about three years ago, and since that time several million have gone into service. Its manufacture has been fully described by Dwyer[9] and Cone[5]. The iron contains 1.35 to 1.60 per cent carbon, 0.85 to 1.0 per cent silicon, 0.60 to 0.80 per cent manganese, 0.40 to 0.50 per cent chromium, and 1.50 to 2.0 per cent copper[9]. Pistons, bearing sleeves, hub castings, and brake drums are made from the same type of iron, with an appropriate heat treatment to obtain the most suitable properties.

Steel Contains Copper

In addition, many cast steel parts which contain copper are manufactured. Clutch pedals, universal joints, and bearing cones are made from an alloy containing 0.15 to 0.35 per cent carbon, 0.60 to 0.80 per cent silicon, 0.40 to 1.20 per cent manganese, and 1.50 to 2.0 per cent copper[10]. Generator housings are made from the same type alloy, but with an increase copper content of 3.50 to 4.00 per cent. Axle housings contain 0.50 to 0.65 per cent carbon, 0.60 to 0.80 per cent silicon, 0.40 to 0.60 per cent manganese, and 1.50 to 2.0 per cent copper.

The addition of copper to ordinary grades of cast and rolled steel results in a pronounced increase in the yield strength. The yield strength is increased more than the tensile strength so that the ratio of yield strength to tensile strength is raised considerably. The high elastic ratios obtained in the copper steels have led to the quite general use of

Table V

Mechanical Properties of Copper Molydenum Cast Irons

Composition of Cast Iron							Mechanical Properties			
							Brinell Hardness	Tensile† Strength lb./sq. in.	Transverse Load*	Transverse Deflection
C	Si	Mn	S	P	Cu	Mo				
2.91	2.0	0.53	0.03	0.16	....	....	200	33,000	2240	0.206
2.91	2.0	0.53	0.03	0.16	1.52	....	223	34,900	2300	0.200
2.91	2.0	0.53	0.03	0.16	3.11	....	238	37,400	2160	0.181
2.99	2.25	0.61	0.03	0.11	....	0.51	207	38,000	2700	0.269
2.99	2.25	0.61	0.03	0.11	0.82	0.51	229	43,000	2900	0.242
2.99	2.25	0.61	0.03	0.11	1.66	0.51	255	47,000	2900	0.243
2.92	1.61	0.64	0.06	0.08	1.23	0.47	259	58,500	3957	0.348

*Transverse bars 1.2-inch diameter tested on 18-inch centers.
†Tensile bars machined from broken transverse bars.

copper in the new low alloy high strength steels which are coming into service where weight is a serious factor. The role of copper in steel has been discussed at length by Williams and Lorig[11].

Development of new and useful alloy cast irons and steels is going forward rapidly. Use of nickel, chromium, molybdenum, and other alloying elements has done much to improve the properties of cast iron. As was the case with the older alloying elements, experimental work in the foundries and research laboratories has been stimulated by the introduction of copper alloy cast irons. Research will find many new uses for copper in cast iron and for the combination of copper with one or more of the other alloying elements to produce cast irons of high quality at low cost. The field for alloy cast iron is growing constantly. It offers new engineering materials with the promise of increased production and profit to foundries.

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Carborundum Band

The Carborundum band has been invited by officials of the Great Lakes Exposition to appear at the exposition in Cleveland in two concerts on Saturday afternoon and evening, July 24, which will be known as Carborundum day.

The band will be one of 22 prominent radio features to appear during the season to play in the mammoth shell known as Radioland.

British Foundrymen Meet at Derby

The thirty-fourth annual conference of the Institute of British Foundrymen will open at Derby from June 8 to 11, with H. Winterton, president of the institute, in the chair. The East Midlands branch is responsible for the organization and details of the program.

The annual general meeting of the institute will take place in the afternoon of Tuesday, June 8, and this will be followed by a reception by invitation of The Worshipful The Mayor (Councillor Mrs. Petty) and corporation of the county borough of Derby.

On Wednesday, June 9, the conference will open at the Guild Hall with an address of welcome by The Worshipful the Mayor of Derby, which will be followed by addresses by the president of the Derby Chamber of Commerce and by the principal of Derby Technical College. Following these addresses there will be the presentation of the Oliver Stubbs medal and of the E. J. Fox medal, this being the first occasion of the presentation of the E. J. Fox medal.

After the induction of the new president and vice presidents, C. W. Bigg, Qualcast Ltd., Derby, the president-elect, will deliver his presidential address. This will be followed by the third Edward Williams lecture, by Prof. C. H. Desch, National Physical Laboratory, Teddington, the subject being: "Factors in the Casting of Metals." At the end of this opening session the report of the costing sub-committee of the technical committee will be presented and discussed.

On the Thursday morning the conference will be resumed at the Technical college and papers will be discussed in two sessions, one of which will be devoted to papers on nonferrous subjects. The annual banquet will take place in the evening of Wednesday, June 9, being followed by a dance, and in the evening of the next day there will be an informal social in the Assembly Rooms.

A number of works visits have been arranged for the afternoons of Wednesday and Thursday, June 9 and 10, and a special program has been arranged for the ladies. On Friday, June 11, there will be an excursion to enable visitors to admire the beautiful scenery of the Peak district. The following papers will be presented and discussed at the meetings:

"Recommendations Concerning the Establishment of Costs in a Gray Iron Foundry," by the costing sub-committee of the technical committee; "Wear Tests on Ferrous Alloys," by O. W. Ellis (American exchange paper); "Additional Data on the Manufacture of Ingot Molds," by R. Ballantine; "Foundry and Laboratory Characteristics of Cupola Coke," by H. O'Neil and J. G. Pearce; "Elimination of Gaseous Impurities in Aluminum," by Prof. Georges Chaudren (French exchange paper); "Remelting Aluminum in the Foundry," by H. Rohrig (German exchange paper); "Notes on the Structure and Characteristics of Aluminum Alloys," by H. C. Hall; "Trends in the Nonferrous Foundry," by L. B. Hunt; "The Use of Nickel in Nonferrous Alloy Castings," by J. O. Hitchcock.

Nominates Officers At Pittsburgh

"Manufacture of Gray Iron Castings" was the subject of a talk by J. H. Johnston, assistant superintendent, Trafford foundry, Westinghouse Electric & Mfg. Co., at the monthly meeting of the Pittsburgh Foundrymen's association in the Norse room of the Fort Pitt hotel on Monday evening, April 19.

The meeting was attended by 117 members. A one-hour discussion followed Mr. Johnston's address, with members asking numerous questions on the iron used, the sand, and the manufacture of castings.

A. M. Ondreyco, former president of the association and now connected with Meehanite Metals Corp., Pittsburgh, was discussion leader.

The nominating committee has placed in nomination the following for officers and executive committee for the fiscal year beginning July 1, 1937:

President, H. M. Wilson, Taylor-Wilson Mfg. Co.; vice president, O. Nadolny, Duquesne Pattern & Bronze Co.; secretary-treasurer, C. H. Paul, Mackintosh-Hemphill Co. Executive committee: H. P. Spilker, Sterret-Thomas Foundry Co.; T. A. Reynolds, McConway & Torley Corp.; W. H. White, Pittsburgh Rolls Corp.; J. H. Johnston, Westinghouse Electric & Mfg. Co.; and R. C. Heaslett, Continental Roll & Steel Foundry Co. The election will be held at the May meeting in the Roosevelt hotel.

The annual outing of the Pittsburgh association will be held on Monday, June 21.

McVoy-Hausman Co., 2019 Sixth avenue, North, Birmingham, Ala.; John A. Dodd, 101 Marietta building, Atlanta, Ga.; and Ryan Sales Corp., 160 Second avenue, North, Nashville, Tenn., have been appointed district representatives of the Pennsylvania Pump & Compressor Co., Easton, Pa.

Did YOU *see the new* TYPE W ROTO-CLONE *at the Foundry Show?*

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and get complete information on this new Roto-Clone development in which water sprays in combination with dynamic precipitation has established new high standards of dust control in the Foundry field.

AMERICAN AIR FILTER CO., INC.

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Speed Metal Analysis

(*Concluded from page* 41)

routine cast iron production would run about as follows:

Cr. . .	0.10-1.00%	Mo. .	0.10-1.00%
Cu. . .	0.20-1.00%	Ni. . .	0.15-2.00%
Mn. .	0.40- .90%	Si. . .	1.00-2.75%

It is evident that the range of

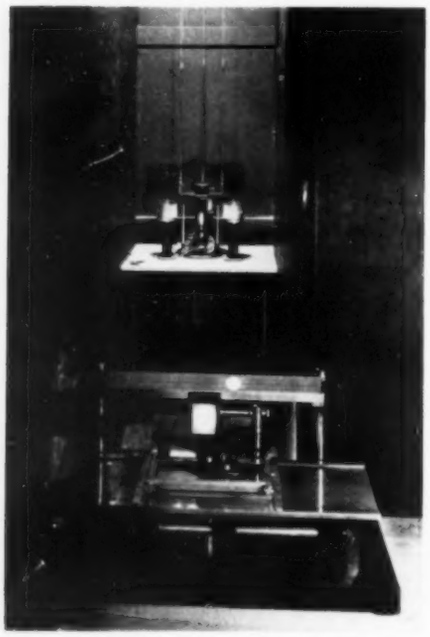

Fig. 2—Range of analysis of the spectrograph is wide enough to include the demands of current foundry practice

analysis by the spectrograph is sufficiently large to include the demands of current foundry practice. If a wider range of composition is to be covered, suitable changes in the source may be made.

The cost per analysis by this method is considerably less than the cost for analysis by gravimetric or volumetric chemical means. This makes it possible to analyze the iron alloy more frequently without added expense to the producer, the closer adherence to specifications is thereby made possible. Frequent analysis also reduces the number of rejected castings.

This is well illustrated by an incident which occurred in the plant of the Campbell, Wyant & Cannon Foundry Co. Camshaft iron containing 0.35 per cent chromium and 0.45 per cent molybdenum was being melted in the cupola. In this case spectrographic analysis of the 8 o'clock sample of camshaft iron showed high chromium and low molybdenum. The operators of the furnace were immediately advised of this fact and the furnace was taken out of production.

The boxes of alloy material being supplied to the furnace were checked spectrographically and, as suspected, both proved to be chromium, whereas one box should have contained molybdenum. The error was corrected and the furnace was again put in operation. If ordinary chemical means of analysis had been used in this instance it is doubtful if the error would have been discovered until hours later. The scrapping of castings would have been expensive.

Compare the Results

A comparison of the results obtained from the chemical and spectrographic laboratories of the Campbell, Wyant & Cannon Foundry Co. brings out some interesting facts with regard to the relative accuracy of these two methods. The accompanying graph gives a comparison of repeat analysis for silicon in cast iron.

Two determinations on the same sample of iron alloy were made for each point plotted. If the two analyses varied, the difference in percentages was plotted as shown. The results from the chemical laboratory are the results of routine controlled analyses and are not expected to have the highest attainable precision. Repeat analyses were run only in case the chemical analysis varied widely from the expected composition, or from the spectrographic analysis. It is clear, however, that the spectrographic analyses show superior reliability.

The advantages of this spectrographic method of analysis over gravimetric and volumetric chemical methods may be summed up as follows:

1. Wide deviations on repeat analysis are minimized because the process is entirely instrumental and does not require continuous concentration on many details.

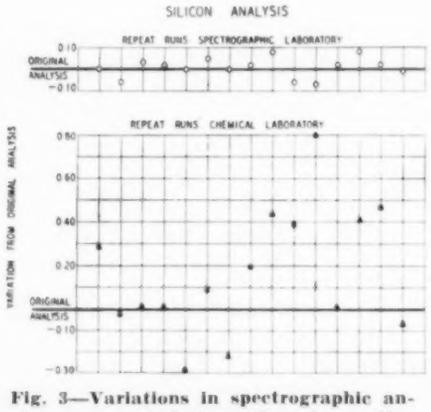

Fig. 3—Variations in spectrographic analyses are much less than in routine chemical analyses

2. Because of the speedy analysis obtained by this method, more careful control of composition during routine foundry operations is possible.

3. The personnel cost per analysis, using this method, is much less than the cost using gravimetric chemical methods.

While the work for the Campbell

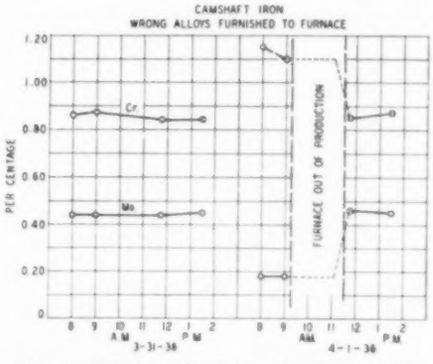

Fig. 4—Rapid estimation of elements by the spectrograph prevents pouring of iron of the wrong composition

Wyant & Cannon Foundry Co., was restricted to cast irons, there is every indication that variations of the method will permit the application of the spectrograph to practically all of the quantitative analysis control problems.

To Install Foundry At Battelle

A complete experimental foundry will be installed in the new laboratory building now under construction by Battelle Memorial institute, Columbus, O. Melting equipment will include a 500 pound indirect arc furnace, a 300 pound high frequency induction furnace, a 500 pound direct arc furnace, a 500 pound low frequency induction furnace, an experimental cupola, a rotary furnace, two small high frequency spark gap furnaces and several fuel fired crucible furnaces.

Space has been provided for a molding floor so that a variety of commercial sized castings can be handled easily. The institute has carried on extensive fundamental and industrial research in steel, cast iron and nonferrous alloys. The new foundry is expected to be in operation by early summer.

While there is no definite rule, it is believed that loads of not to exceed 100 pounds should be considered the efficient load limit for the average man. Fatigue or weakness often will be found as the cause of dropped loads. It certainly is inefficient for workers to lift to their capacities.

ADVERTISING PAGES REMOVED

Annealing Time Shortened

(*Continued from page* 43)

nealing cycle for a long time. However, while he was concerned primarily with the batch-type furnace, the thought occurred to him that certain features of the tunnel-type furnace has possibilities of application in the former. With that in mind he consulted engineers of the Surface Combustion Corp., Toledo, O., who had designed and constructed the tunnel-type furnace previously mentioned, and after considerable experimental work a batch-type furnace was designed, constructed and placed in service in the plant of the Wagner Malleable Iron Co.

Reduced To 50 Hours

The furnace has been on a regular production schedule since about Feb. 1, 1937, and its present operating cycle is 48 to 50 hours plus 15 to 20 minutes for loading and unloading, as compared to a 6 to 7-day cycle with the regular annealing furnaces. The furnace has a capacity of 36,000 pounds or 18 tons, uses no pots, and is fired by gas. Castings made by the Wagner company include automotive parts, washing machine parts, electrical fittings and railroad castings which weigh from 4 ounces to 12 pounds each. The white iron is melted in the cupola, and refined in an oil-fired air furnace. The final iron has the following composition range: Carbon, 2.45 to 2.65 per cent; silicon, 0.95 to 1.10 per cent; manganese, 0.38 to 0.44 per cent; sulphur, 0.13 to 0.14 per cent, and phosphorus, 0.13 to 0.14 per cent. Iron annealed in the new furnace shows a tensile strength from 55,000 to 61,000 pounds per square inch, and a minimum elongation of 11 per cent.

Figs 1 and 2 show views of the furnace which is 4¼ x 8 x 27 feet inside. The exterior is composed of a gas-tight, welded-steel casing lined with insulating brick, and insulating firebrick. The sidewalls are comprised of 4½ inches of insulation brick next to the shell, followed by 9 inches of insulating firebrick for the sidewalls proper. The top arch is constructed of 9 inches of insulating fire brick which is covered with 6 to 18 inches of flake insulation. The bottom is built up of 2½ inches of insulating brick followed by 10 inches of insulating fired brick. On top of that are constructed the firebrick piers for supporting the furnace rollers.

Lift type doors, counterbalanced for hand operation, are located at each end of the furnace. They are lined with 9 inches of insulating firebrick, and 2 inches of insulating brick. A sand seal at the bottom, and locking devices embodying an eccentric roller, permit tight sealing of the doors during operation. As mentioned previously, heating of the furnace is accomplished by alloy steel tubes through which a long, radiant gas flame is passed. The tubes are U-shape and W-shaped, and are about 3 inches inside diameter. Twenty-two tubes are used in the furnace, of which 12 U-shape are located on the bottom, below the conveyor and 10 W-shape are located above the work, giving a total of 64 cross tubes.

Alternate tubes are fired on opposite sides of the furnace. Each tube has its own diffusion type, premix burner which can be controlled independently. At the exit end of each tube is a special orifice type eductor to control the length of the flame, and the composition of the products of combustion to within ½ to 1 per cent excess oxygen, and 10 to 11 per cent carbon dioxide. Use of the eductor principle also is claimed to eliminate the possibility of the products of combustion entering the furnace in case of tube failure through cracking as a negative pressure is created inside the tube.

Circulate Air Through Tubes

Cooling of the furnace is accomplished by shutting off the gas flame and circulating air through the tubes. The circulating air is drawn through the tubes by the eductors, as in the case of the flame, and the same means is employed for controlling the rate of flow. The tray on which the castings are charged into the furnace is composed of alloy steel plates 2 x 3 feet, arranged with hinges so that they may be hooked together to form one continuous plate. Twenty-four sections forming a tray 6 x 25 feet are used. In use, the alloy tray is covered with plain carbon steel plates 4 x 6 feet, and ⅛-inch thick.

The tray is supported in the furnace on 6 alloy steel, roller rails spaced 1 foot apart. The rails are 6 inches high and form a bearing for the rollers. Figs. 1 and 2 show the arrangement, except that the roller rails shown are made of cast iron as they are part of the transfer car and remain outside the furnace at all times. The tray is moved into and out of the furnace by a conveyor chain which passes under the furnace, and which is hooked onto the ends of the tray.

Proper atmosphere in the furnace is maintained through the use of a nonoxidizing gas manufactured in a generator supplied by the Surface Combustion Corp. The generator, or DX gas machine as it is called, constitutes a method of burning air and gas together so that an end product of constant composition is maintained under the desired back pressure. The machine is comprised of a combustion chamber, scrubbers, coolers, etc., and supplies a dry gas for the work.

After the furnace is charged and the doors sealed, the hot furnace at approximately 750 degrees Fahr. is purged 2½ hours with gas containing 8 per cent CO_2, zero oxygen and 4 per cent CO. At that time the furnace temperature has increased to about 1250 degrees Fahr., and the gas composition is changed to 9½ per cent CO, zero oxygen and 5 per cent CO_2. When the temperature reaches 1500 degrees Fahr., natural gas is admitted to the furnace in the ratio of 5 parts of prepared gas to 1 part natural gas which gives a furnace atmosphere of 15 per cent CO, 5 per cent CO_2, and zero oxygen for 2 to 3 hours.

Furnace at Maximum Temperature

At the end of that period the furnace has reached a temperature of 1725 degrees Fahr. and admission of the natural gas is stopped as the metal being annealed supplies sufficient CO to keep the atmosphere at 15 per cent CO, 5 per cent CO_2, and zero oxygen. That composition then is held throughout the remainder of the cycle.

As previously mentioned, the iron is annealed in a cycle comprised of 5 distinct intervals. The first is the heating up period, and in the new furnace it requires 8 to 9 hours to raise the temperature from 750 degrees to 1725 degrees Fahr. The second interval is the holding or soaking period at the maximum temperature which now is set at 15 to 18 hours although tests indicate that it can be accomplished in 10 hours for light section work.

The third period of cooling to approximately the critical point is performed extremely rapidly; reducing the temperature from the maximum of 1700 degrees to 1425 degrees in the space of 2 hours. That is accomplished by shutting off the gas supply, and drawing outside air through the tubes at a rapid rate. The eductors at that time are adjusted to supply a pressure of 20 ounces per square inch. When the temperature reaches 1425 degrees, the fourth interval of slow cooling through the critical point to attain equilibrium, begins. That is obtained by reducing the flow of air through the furnace tubes; adjusting the eductors to supply a pressure from 3 to 5 ounces per square inch. Cooling through the critical range takes 12 hours, and then the furnace is cooled rapidly from 1300 degrees to 1250 degrees Fahr. in 2 hours

(*Concluded from page* 133)

after which the charge is pulled from the furnace.

Approximately 60,000 cubic feet of natural gas with a thermal capacity of 1000 B.t.u. is used to heat a furnace charge of 36,000 pounds. For maintaining the proper atmosphere within the furnace approximately 420 cubic feet of gas is used in the gas machine per hour, and 150 cubic feet of straight natural gas is added per hour during part of the cycle. With a gas cost between 23 to 25 cents per 1000 cubic feet, it is said that the fuel cost per ton is 77 cents, and the total gas cost including the conditioning gas is 95½ cents per ton. With the ordinary batch-type furnaces used by the Wagner company, which were fired by gas, the fuel cost was about $2.61 per ton so that in that item alone there is a saving of $1.65 per ton.

In addition to the fuel saving there also is a saving in the elimination of the old pot cost of approximately $3 per net ton annealed. The new furnace employs alloy trays and tubes as previously mentioned, and it is estimated that replacement cost of those items will not exceed 25 cents per net ton. It also is estimated that by elimination of packing and handling the heavy pots the labor cost will be reduced approximately 50 per cent.

Previously it was stated that unloading and reloading the furnace took from 15 to 20 minutes, and it may be of interest to show how that rapid operation is performed. Fig. 3 shows a transfer car containing a tray with its charge already loaded for admission to the furnace. A similar empty car is placed in front of the furnace as shown in Fig. 1, and when the charge is ready for unloading it is pulled out onto the car by a conveyor chain. That car containing the still hot charge is moved away from the front of the furnace, and the loaded car substituted. Then the end of the conveyor chain is attached to the end of the tray, and it is pulled into the furnace.

Dust Control Group Elects Officers

The Dust Control Equipment association, Penton building, Cleveland, selected the following officers at a recent meeting: President, H. B. Loxterman, Blaw-Knox Co., Pittsburgh; vice president, M. A. Eiben, Northern Blower Co., Cleveland; executive secretary-treasurer, Arthur J. Tuscany, Cleveland. The association also has appointed an engineering committee which will develop standards of dust control practice, according to Mr. Tuscany. The committee also will be available for consultation with other groups.

Stresses Selection Of Apprentices

E. R. Plowden, state supervisor of vocational training, Alabama, emphasized the necessity for careful selection of men for apprentice training, in his talk before the Birmingham District Chapter of the American Foundrymen's association April 16 at the Tutwiler hotel, Birmingham, Ala. Mr. Plowden, speaking before a large number of apprentices as well as members, discussed the work done by his department and gave suggestions as to organized courses of study to be carried, along with the plant work. The speaker also stressed the importance of developing mechanical skill and technical information at the same time.

R. C. Harrell, superintendent of the gray iron foundry, Stockham Pipe Fittings Co., talked on apprenticeship in general and emphasized that the South had been somewhat backward during recent years in developing talent along that line. Foundries must go into apprentice training on a larger scale than heretofore, by necessity, he said. The subject of Mr. Harrell's talk was "Vocational Training as a Co-operative Agency Between Men and Management."

Warren W. Wolfe, apprentice supervisor, American Cast Iron Pipe Co., related various details of the apprentice training plan in effect at the American company, as a concluding speech of the evening. S. D. Moxley served as program chairman.

Talk on Equipment At Chicago

Speakers representing 13 different manufacturers of foundry equipment were on the program at the annual equipment night of the Chicago chapter, American Foundrymen's association, April 12. Attendance of more than 150 was the largest of the year.

The program was in the nature of a preview of the exposition of foundry equipment held at the national convention in Milwaukee and provided each speaker only five minutes to discuss the important features of his production.

Companies represented by talks included: American Air Filter Co., Louisville, Ky., American Foundry Equipment Co., Mishawaka, Ind., C. O. Bartlett & Snow Co., Cleveland, H. W. Dietert Co., Detroit, Herman Pneumatic Machine Co., Pittsburgh, Hydro-Blast Corp., Chicago, Mathews Conveyor Co., Ellwood City, Pa., Modern Equipment Co., Port Washington, Wis., National Engineering Co., Chicago, Norton Co., Chicago, Pangborn Corp., Hagerstown, Md., Claude B. Schneible Co., Chicago, Whiting Corp., Harvey Ill.

Preceding the equipment program, prizes were presented to the three winners in the molding contest conducted among Illinois high schools. In a brief talk Wm. H. Johnson, superintendent of Chicago public schools, outlined plans for a large vocational training school which it is hoped will be built in Chicago in the near future and which will include practical training in foundry practice as well as other trades for those high school students who intend to enter practical work rather than enter college.

Elmer Rich II of American Foundry Equipment Co. was awarded a prize as the most effective speaker on the equipment program, the winner being decided by vote of the audience.

Societies Form New Organization

Twenty-two technical institutions and societies in Great Britain have co-operated to establish a joint committee on materials and their testing consisting of one nominated representative of each organization. The joint committee will act as the British national organization in matters relating to materials and their testing with the following objects: To promote joint discussions on the wider aspects of those subjects; to assist a co-operating institution or society in the presentation of a paper or group of papers dealing with a more detailed aspect of one of the subjects, and to undertake those duties with respect to international matters which properly rest with the joint committee.

Dr. H. J. Gough is chairman, and C. W. J. Taffs, Institution of Mechanical Engineers, is secretary. Office of the joint committee is Storey's Gate, St. James's Park, London. At present the committee is engaged in making arrangements for a general discussion of the notched-bar test to be held in Manchester in the early autumn.

Builds Addition

American Steel Abrasive Co., Galion, O., is constructing a separate office building and an addition to the present plant consisting of a warehouse and mill building. New machinery will be installed in the mill building which will be of two and five stories. The program will be completed in from 4 to 6 months according to Norman K. Kann, secretary-treasurer.

★ ★ ★ ★

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THE "NoPlug" CONTROLLER . .

- • • affords positive protection of drive mechanism
- • • prevents abuse of motor, controller, batteries, tires and entire running gear
- • • minimizes repair and maintenance costs
- • • is standard on all new Baker Trucks

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- • • can be installed on all Bakers now in service.

The biggest slice of the repair and maintenance dollar on electric industrial trucks has always been traceable to the ability of truck-operators to shift instantly from full-speed-forward to full-speed-reverse (and vice versa)—a constant temptation and a constant threat to motors and driving mechanisms.

"PLUGGING" ELIMINATED

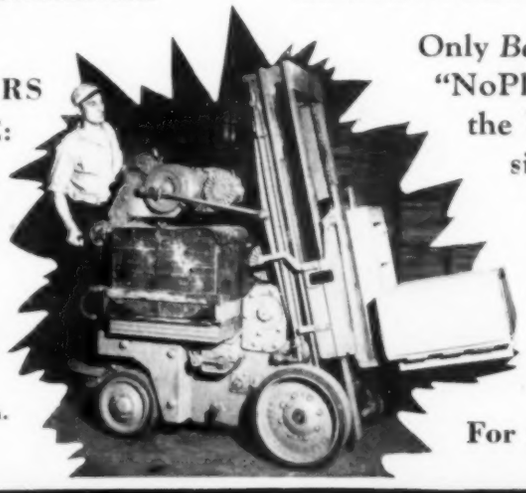
With the Baker "NoPlug" Controller, "plugging" is impossible . . . careful operation COMPULSORY. When the "NoPlug" is thrown from forward to reverse (or vice versa), nothing happens . . . no power is applied. The operator must bring the truck to an almost complete stop before power takes effect in the opposite direction. A definite interval in first speed is compulsory, insuring most effective and efficient use of current and insuring faster get-away.

LOWER MAINTENANCE COST ASSURED

Only *Baker* Trucks give you the protection of "NoPlug" Control. In combination with the Baker Duplex Compensating Suspension, (also exclusive), which cushions shock and eliminates strain between axles and frame, the "NoPlug" puts Baker Trucks far out in front in durability, low maintenance cost and uninterrupted operation.

BAKER OWNERS PLEASE NOTE:

The demand for "NoPlug" Controllers for replacement use is already taxing our production capacity. Orders are being filled strictly on a first-come, first-served basis. To avoid delay and disappointment later we recommend early action.



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The most economical way to handle material is NOT to HANDle it

Fig. 1—Judges in the apprentice contest. Left to right—Frank Frittinger, Lake City Malleable Co.; James Stevenson, Johnston & Jennings Co.; Carl Beattie, Lake City Malleable Co.; Pat Dwyer, The Foundry; William Feth, Forest City Foundrie Co

Cleveland Trade School Stages Contest

IN PREPARATION for the national apprenticeship contest at Milwaukee, one of the features at the annual convention of the American Foundrymen's association, patterns and castings made by apprentices in Cleveland patternshops and foundries were displayed at the Cleveland Trade school April 15.

Nine entries were received in the patternmaking class, four in steel castings, 14 in brass castings and 22 in gray iron. Boys from Cleveland Trade school employed by the following Cleveland shops participated: Allyne-Ryan Foundry Co.; Bowler Foundry Co.; Brost Pattern Works; Chandler & Price Co.; East End Pattern Works; Foote-Burt Co.; Fulton Foundry & Machine Co.; Grabler Mfg. Co.; Hill Clutch Machine & Foundry Co.; Holmes Bronze Foundry Co.; Johnston & Jennings Co.; Lake City Malleable Co.; Motor Pattern Co.; Murray Ohio Mfg. Co.; National Acme Co.; Pattern Engineering Co.; Standard Pattern Works; United States Aluminum Co.; Wellman Bronze & Aluminum Co.; Western Pattern Co.; West Steel Casting Co. The Foundry Group and the Pattern Manufacturers' association of the Associated Industries of Cleveland awarded prizes of $10, $5 and $3 for the first, second and third in each group.

With 95 out of a possible score of 100 points, first place in the patternmaking contest was awarded George Gedeon, Motor Pattern Co.; second place to Fred Henz, Western Pattern Works, with a score of 94, and third place to Edward Merhar. In the nonferrous casting division first and third places were won respectively by Alex Manuk and Mike Kosd, Cleveland Trade school. Second place went to Stanley Burford, Wellman Bronze & Aluminum Co. For general excellence in gray iron casting first place was awarded Martin Solberg, Hill Clutch Machine & Foundry Co.; second place to Joseph Manwell, Fulton Foundry & Machine Co.; and third place to Anthony Polacek, Chandler & Price Co.

Judges for the patternmaking contest included A. Anderle, Motor Patterns Co.; Pat Dwyer, THE FOUNDRY; George Gedeon, Aluminum Co. of America; Robert Reich, Pattern Engineering & Mfg. Co.; William Schilling, Atlas Foundry Co. Bronze and gray iron castings were judged by Carl Beattie, Lake City Malleable Co.; Pat Dwyer, THE FOUNDRY, William Feth, Forest City Foundries Co.; Frank Frittinger, Lake City Malleable Co.; James Stevenson, Johnston & Jennings Co.

The contest was held under the supervision of James G. Goldie, instructor in foundry practice at the Cleveland Trade school. Mr. Goldie also is a member of the National Apprentice committee and chairman of the apprentice committee of the Northeastern Ohio chapter of the American Foundrymen's association.

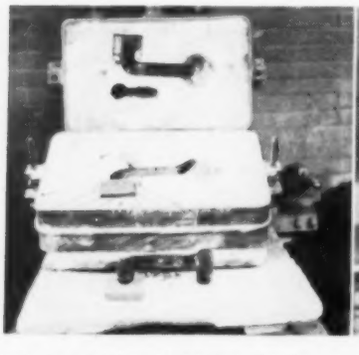
All the patterns were made in the patternshop of the trade school where Frank C. Cech is instructor. According to the rules of the contest, none of the boys saw the blueprint or had any knowledge of the type of pattern to be made, before the time set for the contest. Effect of this rule was reflected in the product, ranging from slightly over 4 hours for the fastest boy to over 8 hours for the slowest. In the final summing up by the judges, awards were made on the basis of 30 points for accuracy to the blueprint, 30 points for moldability, 20 points for workmanship and 20 points for time. Tools, materials, equipment and bench space were provided by the school.

Opens Office

The Penton Publishing Co., Cleveland, has opened a Detroit office at 1010-2 Stevenson building. The office is in charge of A. H. Allen.

Represents Firm

H. Kramer & Co., Chicago, manufacturers of brass and bronze ingots, have established a sales office at 828 North Broadway, Milwaukee. Don F. Stephens is the representative in charge.



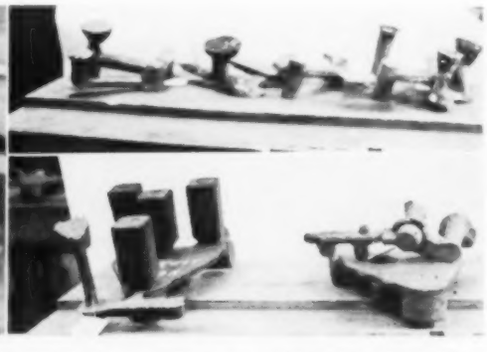
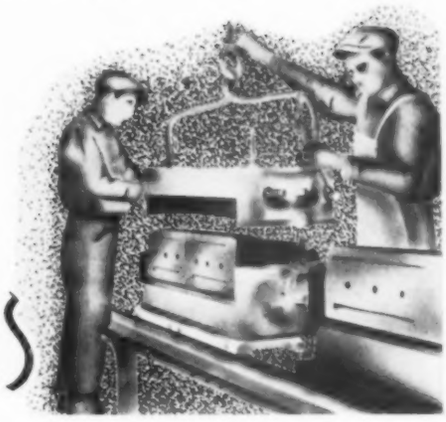


Fig. 2 (Left)—Mold for the brass casting. Fig. 3 (Center)—Patterns were graded according to accuracy to blueprint, moldability, workmanship and time. Fig. 4 (Above, right)—Three prize winning brass castings. Fig. 5 (Below)—Two prize winning iron castings

ADVERTISING PAGES REMOVED

NEW EQUIPMENT for FOUNDRIES



Valve Regulation Of Fluid Flow

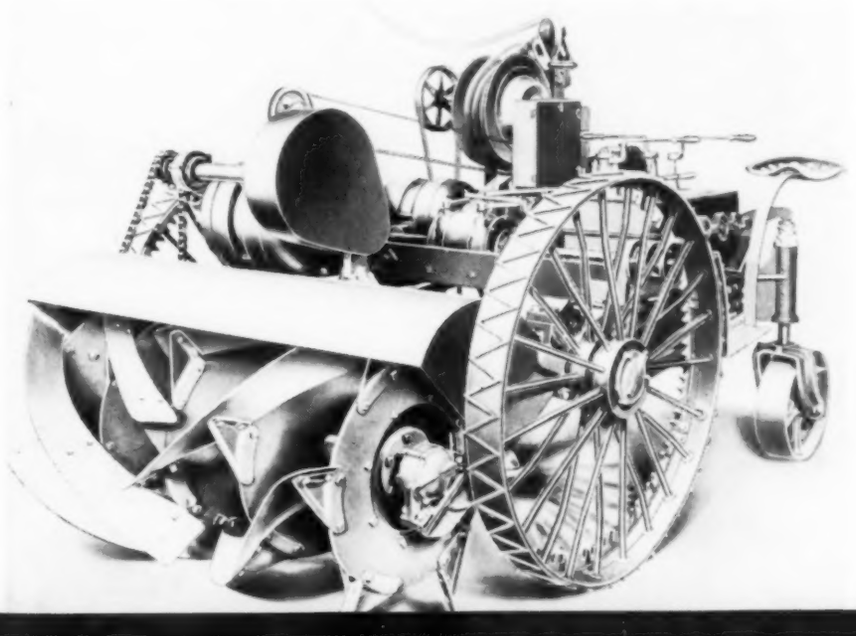
Atlas Valve Co., 282 South street, Newark, N. J., has completed design of a forged steel body high-pressure reducing valve for oil, water and air. Internal metal parts are entirely of stainless steel. A formed packing of special material has been adopted for the unit to eliminate all possibility of leakage. Pressure on the seat is balanced by a piston.

Sand Is Prepared by Cylinder Cutter

American Foundry Equipment Co., 555 South Byrkit street, Mishawaka, Ind., recently designed the new model, heavy duty, portable sand cutter shown in the accompanying illustration. The cutting action, imparted to the sand by a new lawnmower type cutting cylinder, comprises what is said to be a thorough slicing, beating, tossing into the air and crossing the sand from one side of the heap to the other. The sand falls into a ridged windrow formation, ready for molding.

By driving the unit back and forth over the windrow a few times, the sand is piled into a heap beside the bench or molding machine. Overall width of the machine is 19 inches greater than the length of the cutting cylinder. An equalizer permits the steering casters to raise or lower on uneven floors without affecting the balance of the machine. Steering is facilitated by an automatic take-up reel located at the center of gravity which keeps the electric cable taut at all times. Four electric motors supply power for all operations of this sand cutting equipment.

An equalizer permits the steering casters to raise or lower



Light Distributed From the Side

A new 250-watt symmetrical angle reflector has been designed for use with high intensity mercury lamps by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. It is said to provide proper illumination where intensive local lighting of vertical and horizontal surfaces from the side is required. The reflector, with diffusing glass cover, is developed to give a wide spread distribution of light horizontally and an even distribution of light from top to bottom of the vertical surface.

The unit is drawn from 24 gage iron sheet. One ground coat of porcelain enamel is applied all over, and two coats of white enamel inside and one green coat outside with black bead provide the reflecting surface and covering. The acid etched glass cover is hinged directly to the reflector bead, supported at three points, and is released by unsnapping two latches. A heavy water-proof felt provides a gasket between reflector and lens.

The etched glass cover is hinged directly to the reflector bead

Rubber Insulators

B. F. Goodrich Co., Akron, O., has developed a line of rubber insulators for application on mechanical equipment to absorb shock and vibration and to reduce noise. The insulator is said to have a sensitivity to movement eight times greater because it is designed to carry loads in shear rather than in compression. Three standard types are available in addition to special types for heavier

machinery and larger deflections. Standard types range in maximum load from 50 to 3000 pounds.

Designs Industrial Vacuum Cleaner

A new light weight, heavy duty, portable industrial vacuum cleaner has been designed by the United States Hoffman Machinery Corp., air appliance division, 101 Fourth avenue, New York. The unit is equipped with the company's standard design centrifugal vacuum producer, with two outwardly mounted bearings and directly connected to motor through flexible coupling.

The cleaner has a length of 55 inches, width, 22 inches and height of 36 inches. It has two fixed and one swivel mounted rubber tired wheels. A compartment is included on the base for carrying cleaning nozzles and the unit has a 1½-horsepower motor.

Small Compressors Are Introduced

A new series of fractional horsepower air compressors has been developed by the Ingersoll-Rand Co., Phillipsburg, N. J. These units are made in ¼-horsepower, shown in the accompanying illustration, and ½-horsepower sizes. They have automatic start and stop control and are equipped with a new style seamless steel tank and improved check valve.

When supplied for single phase current the units are equipped with a brushless capacitor type motor and a built-in automatic switch, giving overload and under-voltage protection. They are rated for 150 pounds per square inch maximum pressure but may be set for lower pressures or supplied with a reducing valve.

Units are equipped with a seamless steel tank and improved check valve

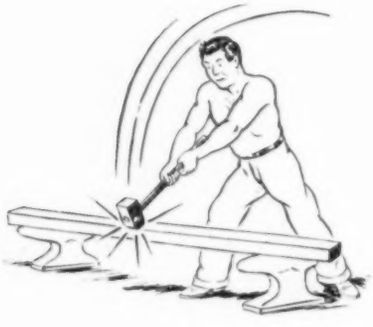
The ¼ and ½-horsepower units are available on a 2.4 cubic foot tank, making the unit less than 35 inches high. The ½-horsepower size is available also on a 4.6 cubic foot tank, in either vertical or horizontal mounting.

Power Mixer Line Is Redesigned

Patterson Foundry & Machine Co., East Liverpool, O., has redesigned its entire line of portable power mixers. Reduction of weight has been attained by the use of aluminum in construction, savings being as much as 10 pounds in the ¼-horsepower size. Polished aluminum and chromium plate finish is employed throughout.

All mixers are fitted with fan-cooled, down-draft, self-ventilating motors as standard equipment and with starting switches built inside of motor frames. Propellers insure complete mixing in the vertical plane and the adjustable shaft is equipped with a heavy duty guide bearing to eliminate whip.

STEEL *from* TROLLEY *to* HOOK



You're sure of long, dependable service with these husky P&H Hoists. There's not just a steel member here and there, but steel throughout . . . wheels, trolley sides, suspension members, cable, lower blocks, hooks . . . and inside, accurately machined gears are carried on husky shafts of alloy steel. Here's modern design not duplicated by any other hoist.

Write for this New Hoist Catalog

In this new bulletin you'll find the answers to many of your handling problems. There's complete information on sizes, types and a host of applications — suggestions that may save you hundreds of dollars from present costs. Ask for Bulletin H-5. Address the Harnischfeger Corporation. 4405 W. National Ave., Milwaukee, Wis.

Handle it *"Off the Floor"* with

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The MONOLITHIC (One Piece) LINING
for LADLES
for CUPOLAS
for BRICKSETTING

ASK any of our regular customers about LUXIT. Chances are he can tell you a story much like the following. This is a "true story" by the way.

"Daily heat 130 tons. Ladles formerly lined with clay and fire-sand mixture two inches thick and lined daily. Now lined with "LUXIT" ¾ inch thick and run six to ten weeks without relining. This firm required 13 men pushing ladles around the shop. Now only 11 men are required due to the fact that the "LUXIT" lined ladles hold more iron and as the thermal conductivity is so much lower the iron is more fluid and holds the heat longer."

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For { Gray Iron Castings / Steel Castings / Special Steel Castings

A preparation which insures sound castings. Eliminates piping in castings. Heads reduced 40%. Eliminates cavities and porosity and greatly reduces scrap heads and runners.
Saves: Labor, Time, Money.

"SPEEDY" MOISTURE TESTER:

Enables you to ascertain moisture content of sand in a few moments. If the moisture content of your sand is required, you cannot do without this simple instrument to ascertain moisture at the sand pile. Ask for further particulars.

References from constant users of all our products gladly submitted. Write for literature.

THE ALPHA-LUX COMPANY, INC.

192 Front St., New York City

PLANTS: Philadelphia, Pa.—Cicero, Ill.

Change Controller

Foxboro Co., Foxboro, Mass., recently has changed the construction of its potentiometer controller. A new universal coil plate has been placed in a bakelite housing, which also contains the standard cell. Resistance coils of the measuring system have been enclosed, exposed wiring has been eliminated and the general appearance of the interior side of the inner door has been changed. Platinum contacts on the slide wire, a different type rheostat and replaceable gold alloy galvanometer suspensions are other additions.

Mica Facing

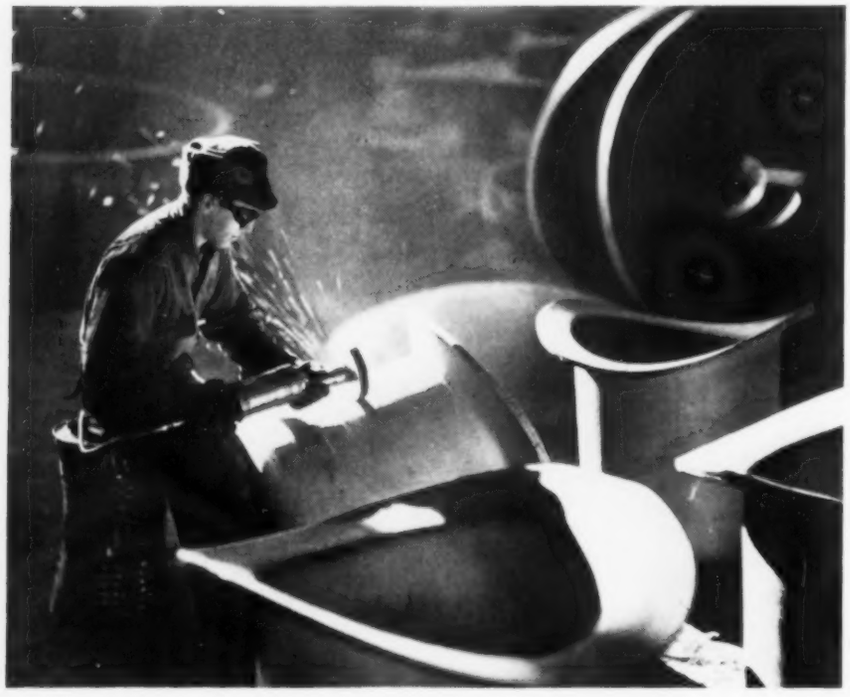
Mica Facing Corp., 182 Market street, Newark, N. J., has introduced a mica facing which it is claimed will stand temperatures up to 4000 degrees Fahr. These facings have been developed for the four principal types of metal cast, a special formula being necessary for each group. One is composed of metals with large manganese content, such as manganese bronze and manganese steel; the second is composed of carbon steels; the third for all nonferrous metals except magnesia, and the fourth for gray iron, semisteels, nickel alloys and magnesia.

Small Hoists Hook Lift 18 Feet

Two new low head room type electric hoists, built in sizes to lift 350 and 700 pounds, have been developed recently by the Shaw-Box Crane & Hoist Co. Inc., Muskegon, Mich. The units are similar to the larger capacity hoists made by the company. Distance from the bottom of the track on which the hoists operate to the hook when in its highest position is 12¾ inches.

Shown in the accompanying illustration, these small hoists have a lifting speed of 20 feet per minute, with rated capacity loads, and give a hook lift of 18 feet. Control is by push buttons contained in a unit suspended from the hoists. The units weigh 185 pounds, and are complete with trolley. The gear train consists of only two gears and pinions. Motor is of the totally enclosed ball bearing type. Hoists are equipped with two brakes, an electrically operated motor brake and an automatic mechanical load brake of the roller ratchet type, which controls the load during lowering. Gearing and mechanical load brake operate in an oil bath. In design the hoist is totally enclosed, all parts being built into the hoist frame.

Control is by push buttons contained in a unit suspended from the hoists



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Whatever the job . . . for production and maintenance, too . . . Abrasive Company Wheels for portable grinders combine fast-cutting action with satisfactory wheel life and give maximum grinding efficiency.

Borolon (aluminum oxide) for Steel . . . Electrolon (silicon carbide) for Cast Iron . . . Resinoid bonded for high speeds . . . Vitrified bonded for regular speeds. May we send details for your requirements?

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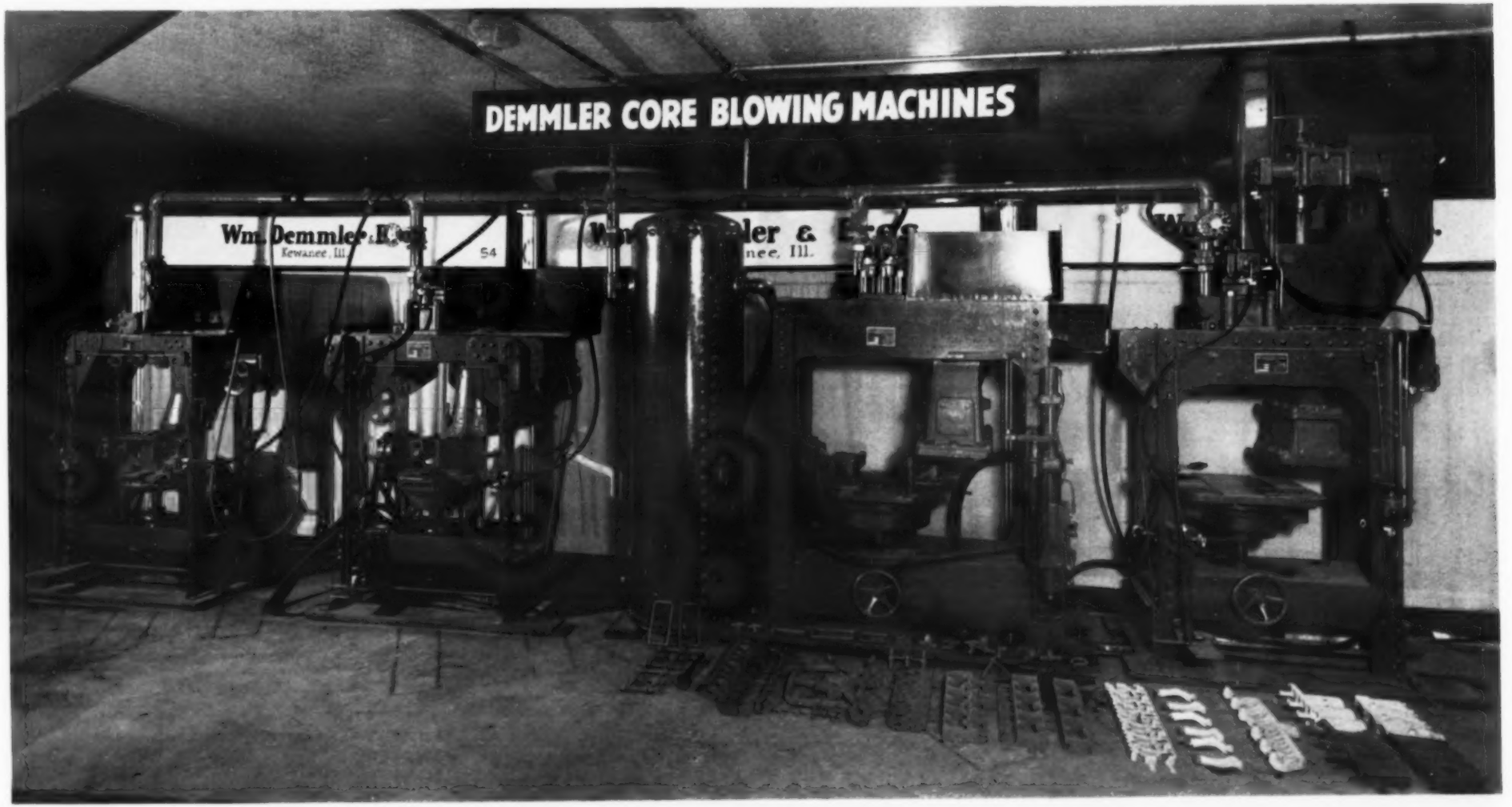


A Core Blowing Machine for Every Job

Your Correspondence Solicited

WM. DEMMLER & BROS. KEWANEE, ILLINOIS

Obituary

CHARLES N. TEETOR, 66, president, Perfect Circle Co., Hagerstown, Ind., died May 2. With his brother John, Mr. Teetor started to make internal combustion engines and organized under the name of the Teetor-Hartley Motor Co. in 1914. In 1916 they decided to specialize in the manufacture of piston rings, under the name of the Indiana Piston Ring Co. Later that name was changed to the Perfect Circle Co.

♦ ♦ ♦

William C. Hedgecock, 48, chief mechanical engineer for the American Steel Foundries, Chicago, died in Evanston, Ill., April 18.

♦ ♦ ♦

Walter T. Jackson, 72, retired foundry foreman at the Killy Foundry Co., Cleveland, died May 3 in Cleveland. He was born in Liverpool, England, and had lived in Cleveland since he was 18 years old.

♦ ♦ ♦

Clayton Potts, Indianapolis foundry owner and head of the plant which bears his name, was killed in a robbery at his plant recently.

♦ ♦ ♦

John G. Miller, western representative of the Ajax Metal Co. with headquarters at 1236 North Dearborn street, Chicago, died April 11. Mr. Miller had a long career with the Ajax company, having served as western representative since 1900. He is survived by his wife, a son and a daughter.

♦ ♦ ♦

John F. Weiss, 41, whose father, Frank J., founded the Weiss Brass Foundry, Cleveland, died at his home in Cleveland April 26. He was born in Cleveland and was associated with the Weiss company from 1910 until 1924, when he resigned to go into business for himself.

♦ ♦ ♦

William Aylward, 75, owner of the Aylward Sons Co., Neenah, Wis., died at his home in that city April 29. Mr. Aylward was born in Neenah and joined his father in the foundry business there. He became owner at his father's death in 1907.

CORE MAKING economies follow quickly when you use durable lightweight core plates! They provide the savings that come with long, efficient service . . . the increased production that comes with easier handling.

Made of a specially treated combination of asbestos and cement, J-M Transite Core Plates are inherently durable . . . offer maximum resistance to cracking and breaking . . . are permanently free from corrosion . . . and there is little, if any, warping.

Yet, this is only half the story on Transite's contribution to lower core making costs . . .

Equally important is the fact that Transite Core Plates weigh only about a quarter as much as metal of equal thickness. Core makers actually carry *twice as many* with considerably less effort! Result . . . up goes production capacity . . . down go core making costs. For complete details, send for our free brochure. Write Johns-Manville, 22 E. 40th Street, New York City.

Johns-Manville
TRANSITE CORE PLATES
JM

A.F.A. Awards Gold Medals

(*Concluded from page* 37)

afterward joined the American Cast Iron Pipe Co., Birmingham, advancing through various stages to his present position as chief chemist and metallurgist. Most of his time is devoted to experimental and research work. In recognition of his many accomplishments his alma mater conferred on him the degree of Doctor of Science in 1930. Dr. MacKenzie has been especially active in many technical organizations and has contributed many papers. He is a member of many important committees of these organizations.

As a member of the American Foundrymen's association he is chairman of the gray iron division, was a prominent contributor to the publication *Symposium on Cast Iron* and is chairman of one of the committees preparing a publication on *Alloy Cast Iron*. He presented the A. F. A. exchange paper before the 1927 meeting of the Institute of British Foundrymen. As a member of the American Institute of Mining and Metallurgical Engineers he was active in promoting the *Alloys of Iron Research* of the Engineering Foundation. In the work of the American Society for Testing Materials he has taken a leading part in the development of specifications for iron castings.

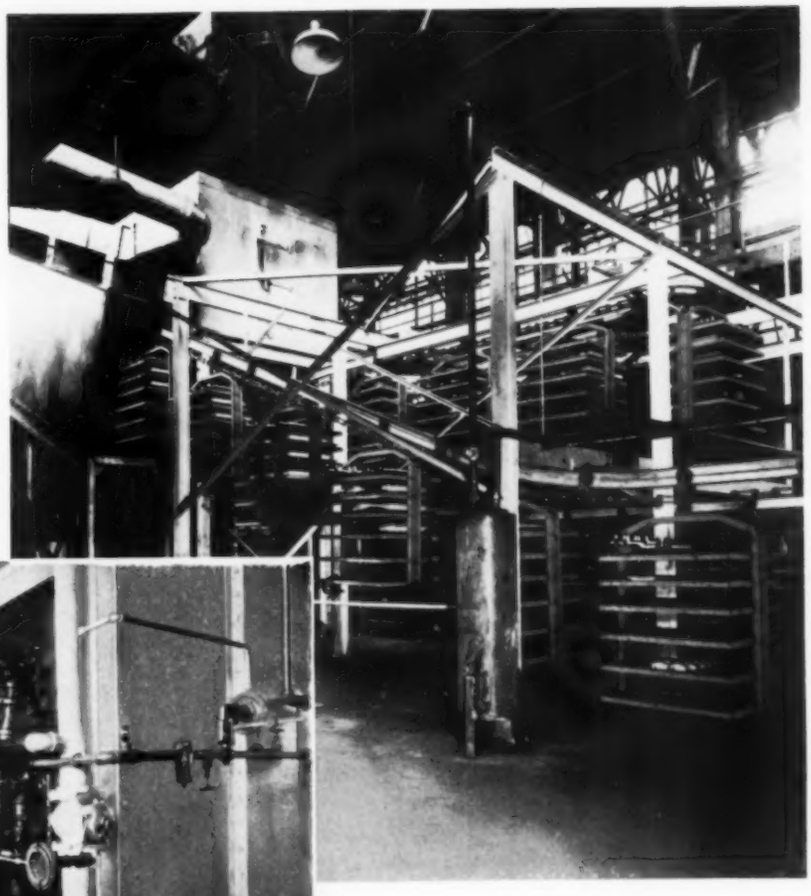
NEWEST ACHIEVEMENT

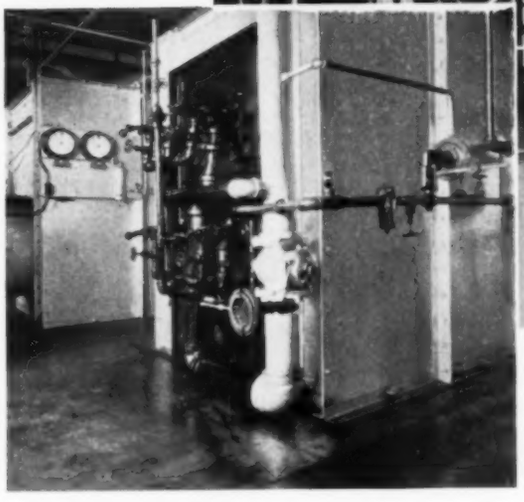
(The Carl-Mayer Way)

IN CONTINUOUS MONORAIL CORE OVENS AT THE STUDEBAKER CORPORATION FOUNDRY

Using Carl-Mayer Ovens

and Carl-Mayer Air Heaters





(Gas) CARL-MAYER Air Heater (Oil) at AMERICAN RADIATOR—PACKARD—STUDEBAKER

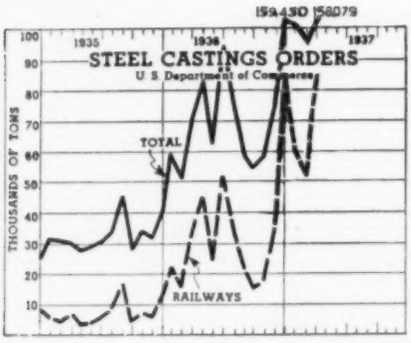
Load end new continuous monorail core oven, air heater, oil (gas) fired at The Studebaker Corporation, South Bend, Ind. Designed and built by CARL-MAYER.

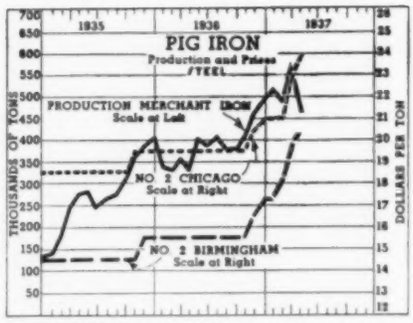
A MESSAGE TO FOUNDRYMEN

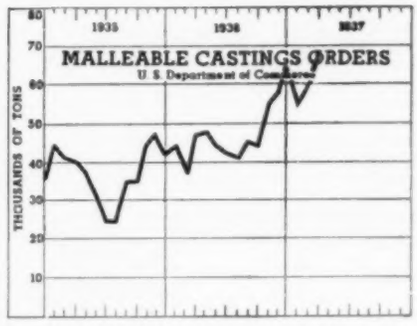
Recent adoption of CARL-MAYER Oven Equipment by such important and successful factors in industry as American Radiator, Electric Autolite, General Motors (subsidiaries), General Electric, Packard, Studebaker, Timken, United Engineering and others may also merit your consideration — before you buy.

Write for new literature to:

3031 EUCLID AVENUE — THE CARL-MAYER CORP. — CLEVELAND, OHIO







Foundry Activities

INDEX of orders, according to a report of the Foundry Equipment Manufacturer's association, Cleveland, was 293.2 in March, 1937, as compared with 248.5 in February, this year, and 115.0 in March of 1936. This index is the second largest in the history of the F.E.M.A., the record being in May, 1928 when the index of orders was 335.6. Index of shipments was 285.6, in March of this year, compared with 201.8 in February, 1937, and 124.0 in March, 1936.

* * *

Riverside Brass Foundry, Elkhart, Ind., is moving its plant to Bremen, Ind., in an expansion program.

* * *

Reading Iron Co., Reading, Pa., has received permit for $25,000 to repair damages suffered from a fire recently.

* * *

General Motors Corp. of Canada, has awarded contract to the Tope Construction Co., Hamilton, Ont., for its new McKinnon unit foundry in Welland, Ont. Nearly $1,000,000 will be spent on construction and equipment. Work has started on the new 312-foot building.

* * *

Crawford Steel Foundry, Bucyrus, O., has been organized recently and probably will be in operation in three months. Walter J. Michael is president.

* * *

Charles L. Gohmann Corp., New Albany, Ind., has been formed to operate a foundry, by Charles L. Gohmann and associates.

* * *

American Manganese Steel Co., Los Angeles, is erecting a new foundry at 5805 Downey road, in an expasion program.

* * *

National Iron Works, San Diego, Calif., will spend $30,000 to modernize its plant and install new equipment. W. B. Dexter, company executive, is supervising the program.

* * *

Hetz Construction Co., Niles, O., has purchased the malleable iron plant of the Warren Tool Corp., Warren, O., and will dispose of the foundry equipment.

* * *

John Burger, 3422 North Fifteenth street, Milwaukee, has leased a section of the Grafton foundry in Fort Washington, Wis., and is equipping the shop for manufacture of special machinery and to do repair work.

* * *

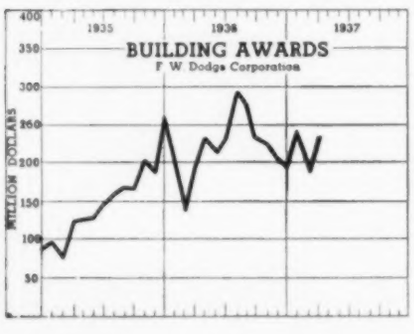
American Steel Foundries, Pittsburgh, has resumed operations at its Verona, Pa., plant, providing employment for 400 men. More than $1,500,000 has been spent since renovation of the plant began a year ago. Idle for the past 8 years, it is ex-

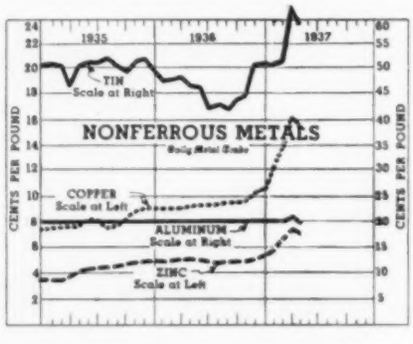
(*Concluded on page* 148)

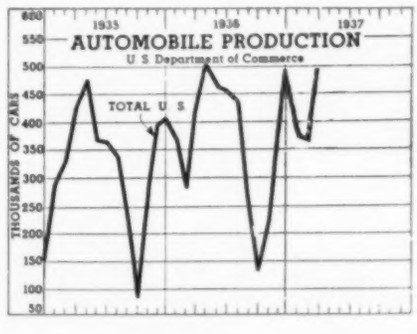
RAW MATERIAL PRICES
May 12, 1937

Iron	
No. 2 foundry, Valley	$24.00
No. 2 Southern Birmingham	20.38*
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	23.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$ 6.00 to $ 6.50
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.10
Scrap	
Heavy melting steel, Valley	$20.00 to $20.50
Heavy melting steel, Pitts. (dlv.)	19.50 to 20.00
Heavy melting steel, Chicago	17.50 to 18.00
Stove plate, Buffalo	14.75 to 15.25
Stove plate, Chicago	12.00 to 12.50
No. 1 cast, New York	15.25 to 15.75
No. 1 cast, mchy, Chicago	15.50 to 16.00
No. 1 cast, Pittsburgh	18.75 to 19.25
No. 1 cast, Philadelphia	20.00 to 20.50
No. 1 cast, Birmingham	14.50 to 15.00
Car wheels, iron, Pittsburgh	20.50 to 21.00
Car wheels, iron, Chicago	20.00 to 20.50
Railroad malleable, Chicago	20.50 to 21.00
Malleable, Buffalo	22.00 to 22.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	13.75
Straights tin	54.87½
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	19.00 to 19.50
Lead, New York	6.00
Antimony, New York	17.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	6.75

*Where phos. is 0.70 and over deduct 38c.







EFFICIENCY

"CERTIFIED" STEEL ABRASIVES

will increase your Blast Cleaning production and reduce your Blast Cleaning cost because—

20 bags of "Certified" Steel Grit, or Steel Shot, will do the work of a carload of sand.
"Certified" Abrasives are sharper, therefore cut quicker.
"Certified" Abrasives are easily cleaned, and may be used over and over again.
"Certified" Abrasives decrease Dust hazards.
"Certified" Abrasives eliminate laborious handling . . . require little storage space.

Most foundries are now specifying "Certified" Steel Shot or Grit and saving money. May we demonstrate to you?

PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.

STEEL SHOT AND GRIT CO.
BOSTON, MASS.

(*Concluded from page* 146)

pected soon to exceed its pre-depression production of 2000 tons of castings per month. W. F. Wilson is plant manager.

* * *

Adirondack Steel Foundries Corp., Watervliet, N. Y., has changed its shares of capital stock and at the same time changed its corporate name to Adirondack Foundries & Steel Inc.

* * *

Lake Erie Foundry Co., Buffalo, manufacturer of gray iron castings, has awarded contract to George F. Summers & Co. Inc. for a one-story addition. Cost is to be about $45,000 with equipment.

* * *

Aluminum Co. of America, Pittsburgh, is erecting a new plant in Los Angeles on a recently-purchased 14-acre site. Land and buildings will cost $750,000. William C. Lynch, manager of the Los Angeles office, will be placed in charge of the new factory.

* * *

Ohio Steel Foundry Co., L'ma, O., has completed the construction of a $35,000 addition to its plant. The improvement will add 25 per cent to the floor area of the company's molding department. The new addition is 75 x 175 feet and adjoins the present foundry proper.

* * *

Holland Furnace Co., Holland, Mich., has put its Fourth street foundry into operation. That plant was occupied at one time by the Burke Engineering Co. and has been idle for 8 years. It will be used for the production of furnace castings, as a supplement to the main foundry.

* * *

Ampco Metal Inc., 3830 West Burnham street, Milwaukee, manufacturer of copper, bronze and alloy castings, forgings, mill bearings, etc., has placed contracts for a general plant extension, 80 x 200 feet, to increase production facilities. Melting capacity will be increased nearly 60 per cent and investment is to be about $75,000. Carl J. Zaiser is president.

* * *

Spartanburg Iron Works, Spartanburg, S. C., a newly-formed company, has purchased the plant and equipment of the Mountain City Foundry & Machine Works on Union street, Spartanburg. W. E. Dye is president of the new firm. Prior to its operation by the Mountain City company, the plant was known as the Standard Iron Works, established more than 20 years ago.

* * *

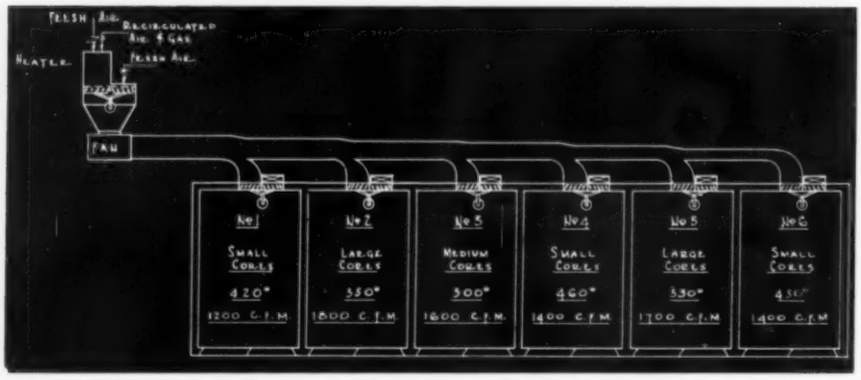
Osborn Bronze Works, Clarksburg, W. Va., has absorbed J. F. Osborn's Sons and the Clarksburg Foundry and has moved its offices and plant from 707 West Main street to Milford road, Clarksburg. The company will manufacture brass, bronze and aluminum castings. The Osborn Bronze Works is owned and operated by Alexander C. Osborn, grandson of the original founder of the firm which was established in 1863.

* * *

Foundry operations in the Philadelphia federal reserve district, according to a report of the industrial research department of the University of Pennsylvania, increased between 12 and 14 per cent during March in regard to the total production of iron and steel castings. Gray iron foundries located in or near Philadelphia had a marked increase of more than 25 per cent. Output of gray iron castings in plants located adjacent to Reading, Pa., increased 17.0 per cent, but the production of castings in the balance of the Federal district decreased 8.7 per cent. Shipments of iron castings also increased during March. Unfilled orders increased nearly 15 per cent.

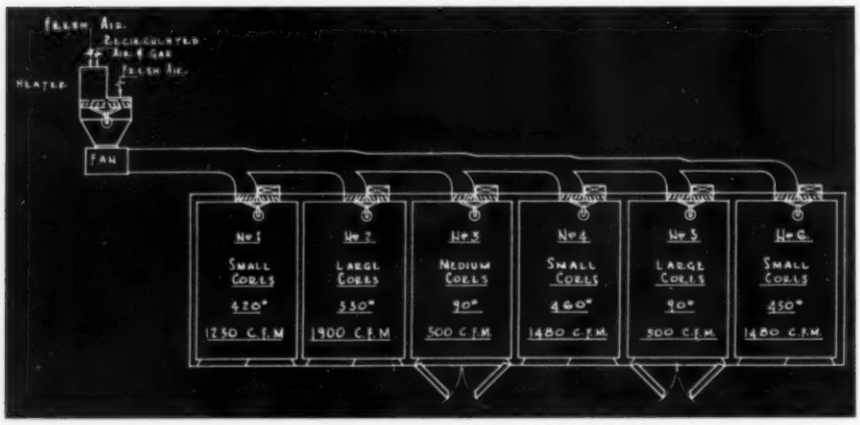
Modernize Your Batch Type Ovens

The D.S.M. Recirculation system permits a single external heater to serve a number of ovens, all of which may require different baking periods and temperatures. For different sizes and shapes of cores.



DIAGRAMATIC LAYOUT—Varying temperatures and volumes in adjoining compartments. One isolated heater—oil or gas fired. Automatic temperature control.

Open an oven or two for unloading. What happens? The temperature in the opened oven is automatically cut off, cold air circulated, and the other ovens continue on under their same baking conditions. No practical change in air volumes or temperatures:



Two compartments opened for unloading. Temperature and volume factors automatically change as indicated above, leaving unchanged temperature and circulation in the compartments still undergoing baking when one or more compartments are being unloaded.

AND IT IS ALL AUTOMATIC. No shifting of hand dampers. The above cuts are diagramatic only, and are not intended to illustrate the interior circulating system in the ovens. Sketch and dimensions of your present installation will enable us to advise cost of modernization.

DETROIT SHEET METAL WORKS

DETROIT - - MICHIGAN

1270 Oakman Boulevard

THE FOUNDRY

A PENTON PUBLICATION

The Foundry, established in 1892 by John A. Penton, a practical foundryman, is published monthly on the fifteenth. It is exclusively devoted to all branches of the foundry industry—gray iron, steel, malleable, brass, bronze, aluminum, has been under the same management continuously for 44 years.

STEEL

Established 1882. Issued weekly. Deals with problems of production, processing, distribution and use of iron, steel and supplementary materials.

Daily Metal Trade

Established 1909. Issued each business day, Monday excepted. Designed primarily to serve the iron and steel, nonferrous metal and metal-working industries as a news, market and price reporting medium.

MACHINE DESIGN

Established 1929. Issued monthly. Devoted specifically and entirely to the design of all machinery in which specification of parts, materials, and finishes plays a major role.

Abrasives

Established 1936 (replacing Abrasive Industry, founded in 1920). Published monthly on the 10th. Devoted to abrasive processes used in the metal-working industry—grinding, polishing, buffing and finishing.

★

Penton Publishing Company
PENTON BUILDING CLEVELAND, OHIO

New Trade Publications

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

HOISTS—Shepard Niles Crane & Hoist Corp., 126 Schuyler avenue, Montour Falls, N. Y., has prepared a bulletin illustrating and describing the design and construction principles of the company's electric hoists. More particularly it points out the advantages of its new anti-friction bearing hoist. General specifications are given including details on both the stationary and traveling types. Range of ratings and capacities with engineering data and accessories complete this comprehensive publication.

PUMPS—Blackmer Pump Co., Grand Rapids, Mich., has issued a folder depicting features of its series of rotary hand pumps with bucket design. The various types of pumps, their capacities, construction, etc., are described in detail. Numerous illustrations point out the pumps available.

FLOW METERS—Brown Instrument Co., Philadelphia, has published a new catalog on its line of recording, integrating, and indicating flow meters, in both electrical and mechanical types. Flow and liquid level controllers also are described. The booklet explains these applications to power plants, water works, gas generation service and general industrial use, and gives construction and operation features.

FIRE BRICK—A. P. Green Fire Brick Co., Mexico, Mo., has issued an attractive booklet covering the various phases in its manufacture of fire brick. Illustrations and description point out the company's processes of molding, baking, testing, shipping, etc.

WHEELS—Geneva Metal Wheel Co., Geneva, O., has issued a comprehensive catalog on its line of wheels for modern transportation. Divided into sections, the booklet covers rubber-tired wheels, steel tires, accessories and special parts. The booklet is indexed clearly with numerous illustrations, specifications, etc.

COUPLINGS—T. B. Wood's Sons Co., Chambersburg, Pa., has issued two new pages to be added to its catalog on couplings. Those described are the steel pin, rubber-bushed type with self-lubricating bronze bushings inside the rubber bushings. Sizes, prices, specifications, etc., are given.

STOCK SIGNS—Horace R. Whittier Co., Pequabuck, Conn., has issued a new listing of approximately three thousand 2½ x 10 inch porcelain enamel stock signs.

TECHNICAL QUESTIONS—Milwaukee Foundry Equipment Co., Milwaukee, has sent out a series of folders in which pertinent questions are asked concerning the foundry industry. Designed as an instructive sheet, the folder gives correct answers in a section set aside from the questionnaire.

MATERIALS HANDLING—Harnischfeger Corp., 4400 West National avenue, Milwaukee, has issued a new bulletin treating both general and specific problems in the industrial handling field. Profusely illustrated, the bulletin lists the ratings and operating ranges for the company's hoists, from the 100-pound capacity to 15 ton capacity sizes, as well as specifications and electrical accessories.

LUBRICATION—Shell Petroleum Corp., Kokomo, Ind., is publishing an attractive illustrated series of booklets entitled "Panorama of Lubrication." The company is presenting the technical processes involved in the refining, distillation, etc., of oil, in an easily understood manner. The first three booklets, now available, cover respectively the fundamentals of lubrication, the lubricating of friction type bearings, and motor oil.

PUMPS—Fairbanks, Morse & Co., 900 South Wabash avenue, Chicago, has prepared a new bulletin describing its duplex, self-oiling pumps for handling mud, slush, clear water, petroleum and other liquids. Construction features are illustrated and dimensions are included.

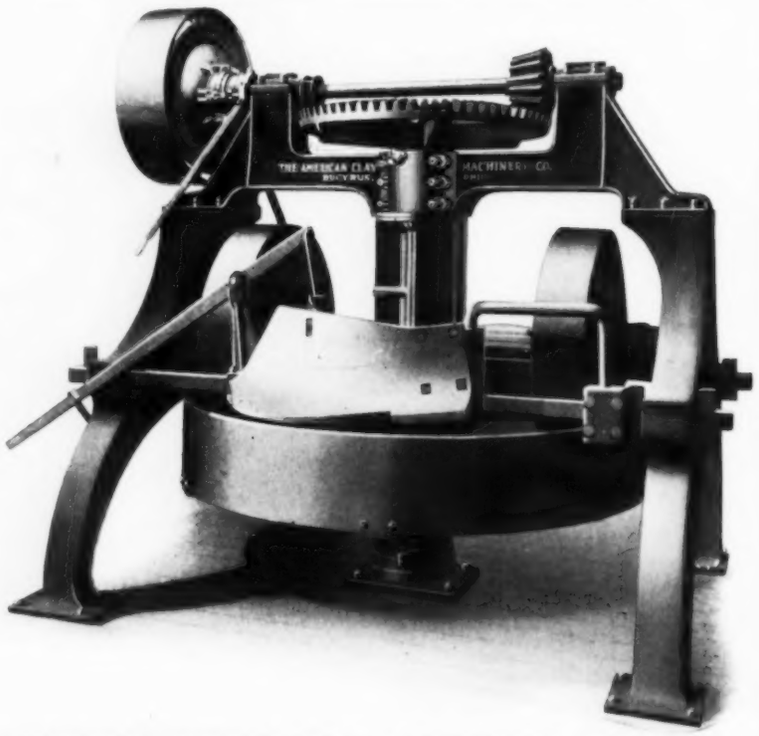
MOTOR-GENERATOR SETS—Reliance Electric & Engineering Co., Ivanhoe road, Cleveland, has published a folder on its motor-generator sets of various types. Illustrations of the different sets are given, with statistical information concerning each.

PICKLING COMPOUND — Grasselli Chemicals department of E. I. Du Pont de Nemours & Co. Inc., Wilmington, Del., has issued a new booklet on a powdered compound used in connection with a sharp pickling solution. The function and application of this nonfoaming agent are explained and the booklet carries a list of chemicals for the iron and steel industry.

DO *you* KNOW?

1. That we manufacture a complete line of foundry pans for the preparation and mixing of molding sand.

2. AMERICAN Foundry Pans are in use in more than fifty of the major foundries in this country.



AMERICAN FOUNDRY PAN with MECHANICAL UNLOADER

● Salesmen interested in handling this line on a commission basis only, write for particulars.

W. A. RIDDELL CORPORATION

SUCCESSOR TO W. A. RIDDELL CO. - HADFIELD-PENFIELD STEEL CO.

AMERICAN CLAY M'CH'Y. CO., BUCYRUS, O.